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National Patterns of R&D Resources: 1996

An SRS Special Report

Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

National Science Foundation

NSF 96-333

APR 1 1 1997

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An SRS Special Report

Steven Payson and John E. Jankowski, Jr.

Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

National Science Foundation NSF 96-333

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NOTE

Data in this report are current as of July 1996. These data are more current (reflecting updates and revisions) than data on the same variables provided in *Science and Engineering Indicators, 1996*, which had been released in January 1996.

FOREWORD

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Jeanne E. Griffith
Director, Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

November 1996

Suggested Citation

National Science Foundation, *National Patterns of R&D Resources: 1996*, NSF 96-333, (Arlington, VA, 1996).

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Data preparation and analysis were performed by Steven Payson and John E. Jankowski, Jr., of the Division of Science Resources Studies.

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ACKNOWLEDGMENTS

This report was prepared jointly by Steven Payson, Economist/Science Resources Analyst, and John E. Jankowski, Jr., Program Director, of the Research and Development Statistics Program (RDS), Division of Science Resources Studies (SRS), National Science Foundation. Many other SRS staff members provided data for inclusion in this report and helped review the document for accuracy and currency.

Particular appreciation is given to Jennifer R. Held (RDS) for her valuable work in producing charts and tables, to Nita Congress and Peg Giglitto for their thorough inspection of the report, and to Andy Black for his skillful development of final tables, charts, and text for the document's camera-ready copy. Guidance and supervision were provided by Jeanne Griffith, Director, and Al Tupek, Deputy Director, SRS.

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ABBREVIATIONS

DOD	Department of Defense
DOE	Department of Energy
FFRDC	federally funded research and development center
FTE	full-time equivalent
FY	fiscal year
GDP	gross domestic product
GSP	gross state product
HHS	Department of Health and Human Services
IRI	Industrial Research Institute
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NSF	National Science Foundation
OPM	Office of Personnel Management
PPP	purchasing power parity
R&D	research and development
SIC	Standard Industrial Classification
SSA	Social Security Administration
S&Es	scientists and engineers

GENERAL NOTES

The National Science Foundation (NSF) sponsors a series of surveys to collect information on the financial and human resources devoted to research and development (R&D). In this report, NSF survey data on the various sectors of the U.S. economy—industry, Government, academia, and selected nonprofit organizations—are aggregated so that the components of the overall R&D effort are placed in a national context. Information presented in *National Patterns* includes the following:

- the level of R&D expenditures;
- the sources of such funds;
- the sector or organization performing the R&D;
- the character of work undertaken (i.e., whether it is basic research, applied research, or development);
- the States in which R&D is undertaken in the United States;
- the number of scientists and engineers employed in R&D; and
- international comparisons with the U.S. effort.

The national totals reported here incorporate data available from several Division of Science Resources Studies (SRS) surveys as of July 1, 1996, with projections to cover the remainder of the year 1996.

These notes provide a brief introduction to the concepts used in the report. Significant deviations from previous *National Patterns* reports are also highlighted. For complete definitions, descriptions of projection methodologies, and references to the underlying survey reports, see appendix A.

PERFORMER REPORTING BASIS

SRS annually surveys Federal Government agencies, industry, and academia. Respondents in each sector indicate the amounts they spend on R&D in their own sector and the sources of these funds. National historical totals are based on data reported by performers because they are in the best position to (1) indicate how much they spent in the actual conduct of R&D in a given year, (2) classify their R&D by character of work, and (3) identify the sector of the economy in which their financing originated. The consistent reliance on performer reporting reduces the possibility of double-counting and conforms to international standards and guidance.

There are exceptions to the use of performer-reported data. The last complete survey of the nonprofit sector was conducted in 1973, although a survey of nonprofit R&D activity is planned for 1997. Since 1973, informal surveys of this sector have been undertaken periodically; nonetheless, the estimates of R&D performance by nonprofit organizations reported here are based generally on (1) Federal agency reporting of Federal funding to the nonprofit sector and (2) R&D performance trends in the other non-Federal sectors.

NSF conducts only occasional surveys of State government agencies; the last two surveys covered fiscal years (FYs) 1977 and 1987-88. Consequently, the national R&D time-series totals exclude estimates of State agencies' intramural R&D performance. State funds for R&D reported by other sectors of the economy, however, are included in the respective R&D performance totals.

One byproduct of the decision to use performer-reported data is that the federally funded R&D performance totals presented in *National Patterns* differ from the Federal R&D funding totals reported by the Federal agencies that provide the funds. One reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays. (For definitions of these terms, see appendix A.) During the past several years, the differences have widened between the Federal R&D funding reported by performers and that reported by funding agencies. These trends are documented in appendix A and tables B-1 and B-2.

PROJECTIONS

Although respondents continually are given the opportunity to revise prior data, the R&D totals for 1994 reported here are considered to be actual expenditures. Data reported for 1995 and 1996 are preliminary, in the sense that 1995 data are based on preliminary reporting of information; and 1996 data are projections made during the summer of 1996 based on information available at that time. The series presented in this *National Patterns* updates projections for 1993 and 1994 that were reported in *National Patterns of R&D Resources: 1994*, including—in particular—revisions to industrial basic research data.

To the greatest extent possible, this report incorporates data for 1996 R&D programs contained in the administration's 1997 budget proposal. Where these data are used, it is explicitly noted in the text. The budget, however, does not contain estimates on the detailed disaggregation reported in *National Patterns*; most importantly, it includes very little information on the economic sectors receiving the Federal funds. Consequently, Federal agencies' R&D performance for 1995 and 1996 are derived from an NSF survey of 32 Federal agencies coinciding with the third quarter of FY 1995; therefore, the amounts reported for 1996 reflect congressional appropriations, apportionments, and reprogramming decisions as of that time.

Industry R&D performance for 1996 is derived from patterns observed in previous years, and from 151 company responses to a mail survey of the Industrial Research Institute's (IRI's) membership during August and September 1995. IRI, which annually conducts this survey, is an association of more than 260 R&D-performing companies, representing such industries as aerospace, automotive, chemical, computer, and electronics.

R&D performance estimates for 1996 for the other sectors of the economy are derived from regression and time-series modeling techniques. Inputs to these models are (1) the performer-reported actual R&D performance data and (2) information on Federal R&D funding of non-Federal sectors, as reported by Federal agencies in the third quarter of FY 1995.

EXPANDED DETAIL IN R&D TIME SERIES

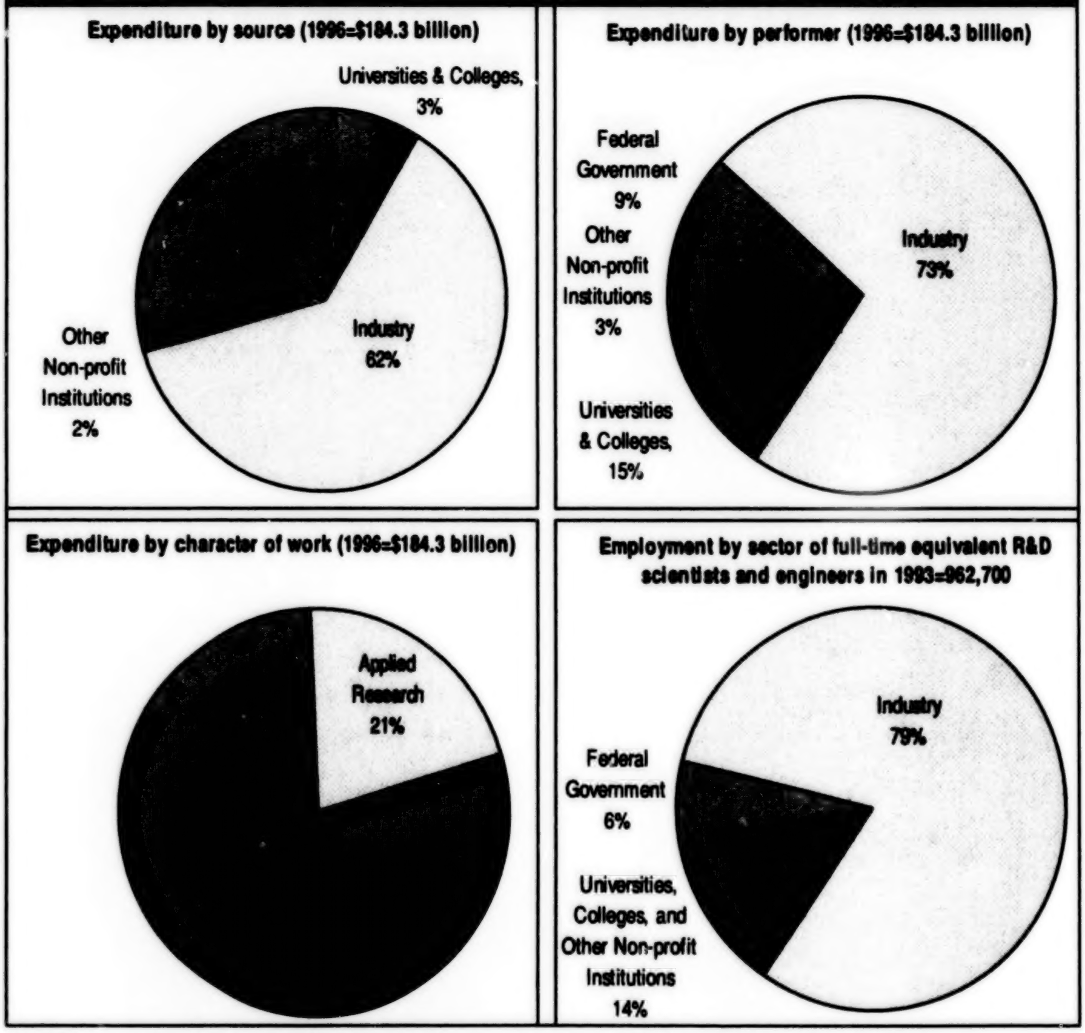
This *National Patterns* is the first to contain 1955–to–present estimates for those federally funded research and development centers (FFRDCs) administered by industrial firms and nonprofit organizations. Previous *National Patterns* contained separate detail on only those FFRDCs administered by universities and university consortia.

HIGHLIGHTS

R&D EXPENDITURES

- According to projections, total R&D expenditures in the United States are expected to reach $184.3 billion in 1996—a 3.2 percent increase over the $178.6 billion spent in 1995. The preliminary 1995 figure represents a 6 percent increase in R&D spending over the 1994 level. In inflation-adjusted terms, total R&D expenditures rose by 4 and 1 percent in 1995 and 1996, respectively; the 1995 increase was the largest since 1985.
- R&D growth continues to be outpaced by the growth of the economy as measured by gross domestic product (GDP). Preliminary measurement of GDP growth indicates a 2.7 percent increase between 1995 and 1996 after adjusting for inflation—well over twice the growth in inflation-adjusted R&D.
- Industry will provide $113.5 billion for R&D in 1996, by preliminary tabulations, representing a 3.5 percent increase over 1995 spending in real (inflation-adjusted) terms. Preliminary Federal R&D funding in 1996 is expected to be $61.9 billion (chart 1), a 3.0 percent decline in real terms from the preliminary 1995 level. Most of the remaining R&D funds is expected to come from

Chart 1. The National Effort



NOTES: Details may not add to 100 percent because of rounding. R&D funds for federally funded R&D centers are included in their affiliated sectors.

SOURCE: National Science Foundation/SRS

universities and colleges and other nonprofit institutions, and the State and local governments supporting them. Their projected $9.0 billion in support in 1996 is virtually unchanged in real terms (only 0.3 percent higher) from the 1995 level. (These estimates are based on performer surveys and modeling techniques outlined in appendix A.)

- Growth in total U.S. R&D expenditures has been slow since the mid-1980s. From 1980 to 1985, R&D spending increased on average by 6.6 percent per year in real terms. From 1985 to 1996, it slowed to 1.4 percent, compared to a 2.6 annual real growth in GDP. Slackening in both Federal and non-Federal funding of R&D as a proportion of GDP has contributed to this slowing, though Federal funding has been declining at a faster rate.

- As a result of recent R&D trends, the proportion of GDP spent on R&D activities dropped to an estimated 2.48 percent in 1996, its lowest share since 1981.

- From 1980 to 1985, national expenditures on R&D activities were fueled largely by major increases in Federal funding for defense-related R&D programs. Defense R&D rose from 50 percent of the Federal R&D budget authority in 1980 to 68 percent in 1985. The defense share peaked at 69 percent in 1986 before declining fairly steadily to its preliminary 54.7 percent share of the 1996 Federal R&D budget authority (as proposed in the administration's 1997 budget).

- The Federal share of R&D funds first fell below 50 percent in 1978; between 1980 and 1988, the Federal Government consistently provided 45 to 47 percent of all funds spent on R&D in the United States. Its share has dropped substantially since then. Its preliminary share of 33.6 percent for 1996 is the lowest recorded since the present data series began in 1953.

- Non-Federal support for R&D fell from a 7.2 percent average annual real rate of increase over 1980-85 to a preliminary 3.3 percent growth rate for the 1985-96 period.

U.S.-INTERNATIONAL COMPARISONS

- The United States spends more money on R&D activities than does any other country. In fact, in 1994 it spent more than Japan, Germany, France, and the United Kingdom combined.

- In 1994—the latest year for which foreign data are available--the United States spent 2.49 percent of its GDP on R&D. In comparison, Japan spent 2.69 percent of its GDP; France, 2.38 percent; Germany, 2.33 percent; the United Kingdom, 2.19 percent; Canada, 1.57 percent; and Italy, 1.19 percent.

- The nondefense R&D/GDP ratio for the United States in 1994 was 2.00 percent; this was considerably lower than the ratios for Germany (2.26 percent) and Japan (2.66 percent). France and the United Kingdom, which have substantial defense R&D efforts, each reported nondefense R&D/GDP ratios closer to that of the United States—roughly 2.09 for France (in 1993—the figure for 1994 being unavailable) and 1.88 percent for the United Kingdom. The ratio for Canada was 1.53 percent, and Italy's was 1.14 percent.

R&D PERFORMANCE BY SECTOR

- Industry is expected to account for 73 percent of the Nation's 1996 R&D performance total. The projected $134.2 billion in R&D performance by industry represents a 2 percent real increase over the preliminary 1995 total. Most (83 percent and growing) of industry's expected R&D performance total, including industry-administered FFRDCs, will be company funded; Federal funding is likely to account for the rest (17 percent). The Federal share of industry's performance total has fallen considerably; it had been 33 percent of the industry total in 1987.

- The Federal Government will perform an estimated $16.2 billion of R&D in 1996 (in current dollars). This figure is slightly lower than the preliminary level for 1995, $16.4 billion, which reflects a real decline of 3.3 percent. Federal agencies account for 9 percent of the projected national R&D performance effort; this reflects a continuation in the gradual decline of Federal funding as a percentage of total R&D that began in the mid-1970s. These statistics are exclusive of the R&D performance undertaken by FFRDCs, which are included in the totals of the administering sectors.

- Universities and colleges—excluding academically administered FFRDCs—account for 12 percent ($22.4 billion) of the projected 1996 national R&D performance effort. According to these preliminary findings, there has been virtually no change (less than 0.1 percent) between 1995 and 1996 in the amount of real R&D performance carried out at universities and colleges.

R&D PERFORMANCE BY STATE

- Data are available on the State distribution of 1993 R&D performance by industry, academia, and Federal agencies, and the federally funded R&D activities of nonprofit institutions. The distribution of R&D performance by State, not unlike the distribution of gross state product (GSP) by State, is highly concentrated.

- Six States (California, New York, Michigan, Massachusetts, New Jersey, and Pennsylvania, in decreasing order of R&D performance) accounted for roughly one-half of the U.S. total R&D in 1993; 10 States (adding Maryland, Texas, Illinois, and Ohio) accounted for approximately two-thirds. In each of these 10 States, at least $6 billion (in constant 1993 dollars) was spent on R&D.

- The highest 24 States in R&D, plus the District of Columbia (which would rank 20th in R&D performance if it were ranked as a State), collectively accounted for approximately 91 percent of the R&D conducted nationwide in 1993.

- As a percentage of GSP, R&D performance in New Mexico was largest—8.1 percent. California, which led the Nation in terms of total R&D performance ($33.7 billion in constant 1993 dollars), had an R&D/GSP ratio of 4.3 percent—seventh highest among the States.

CHARACTER OF R&D WORK

- Preliminary findings indicate that, in 1996, the United States will spend $29.8 billion on the performance of basic research (16 percent of total R&D expenditures), $38.8 billion on applied research (21 percent), and $115.8 billion on development (63 percent).

- Compared to 1995, R&D performance in 1996 reflects a projected 0.9 percent decrease, in real terms, for basic research; a 1.0 percent real increase for applied research; and a 1.5 percent real increase for development.

- The Federal Government provides the majority of funds for basic research. Its share of basic research support has dropped over time as a percentage of all support—from 70 percent in 1980 to a preliminary 58 percent in 1996.

R&D SCIENTISTS AND ENGINEERS

- The estimated number of scientists and engineers (S&Es) employed in 1993 on R&D activities in the United States was approximately 962,700. This figure reflects virtually no change (a 0.2 percent increase) from the 1991 level of 960,400. It reflects a 20 percent increase over the 1985 figure of 801,900, the first year for which revised national tabulations are derived.

- In 1993, industry employed 79.4 percent of these R&D personnel. The industrial classification with the largest share of these employees was the nonmanufacturing sector, which accounted for 25.3 percent of industry R&D employment. This finding illustrates a dramatic change from only 6 years earlier, when the transportation equipment industry had nearly twice as many R&D personnel as the nonmanufacturing sector (187,800 employees versus 99,200, respectively).

- There were 463,000 employed doctoral scientists and engineers in the United States in 1993; 41 percent of these reported R&D as their primary work activity. Teaching as a primary activity accounted for 22 percent; management/sales/administration, 18 percent; computer applications, 4 percent; and other professional services, 15 percent.

TRENDS IN NATIONAL R&D SUPPORT

U.S. expenditures on research and development (R&D) are expected to reach $184.3 billion in 1996 (chart 2). This figure represents a 3 percent increase over preliminary 1995 expenditures ($178.6 billion in current dollars) or a 1 percent change after adjusting for expected inflation.[1] The 1995 level of R&D expenditures represents a 6 percent increase, in current dollars, over the 1994 level ($168.1 billion). In inflation-adjusted terms, total R&D expenditures rose by 4 percent in 1995, the largest real increase since 1985. However, growth in R&D continues to be outpaced by growth of the economy, as measured by gross domestic product. GDP growth between 1995 and 1996 is expected to be approximately 5.0 percent in current dollars, or 2.7 percent after adjusting for inflation.[2]

In 1996, the Federal Government will provide 33.6 percent ($61.9 billion in current dollars) of total projected funds for R&D; industry will supply 61.6 percent ($113.5 billion in current dollars); and the remaining sectors of the economy—i.e., State governments, universities and colleges, and other nonprofit institutions—will contribute 4.9 percent ($9.0 billion).

This funding of R&D continues the trend of slow growth in real R&D support which began in 1986. Not since the early 1970s has there been a period of such protracted low growth in national R&D support. Starting in 1969 and for nearly a decade thereafter, R&D growth failed to keep up with either inflation or general increases in economic output. In fact, between 1968 and 1975, real R&D expenditures declined 7 percent; this drop was due to a deemphasis by both business and Government on funding for research programs. Federal funding in particular fell considerably during this period (down 21 percent in real terms). Both Federal defense- and nondefense-related R&D programs declined (chart 2).

Following the economic recovery from the 1974 oil embargo and the 1975 recession, a significant funding reversal occurred. U.S. R&D expenditures increased in real terms by approximately 67 percent from 1975 to 1985, compared with a 33 percent rise in real GDP over the same period.

During the first half of this period (1975-80), there was considerable growth in Federal R&D funding for nondefense activities. Although defense-related R&D expenditures rose annually, much of the Federal R&D gain was attributable to energy-related R&D (particularly nuclear energy development) and to greater support for health-related R&D. Non-Federal R&D increases were concentrated in industry and resulted largely from greater emphasis on energy conservation and improved use of fossil fuels. Consequently, energy concerns fostered increases in R&D funding by both Federal and non-Federal sources. Support for energy R&D rose 140 percent in real terms between 1974 and 1979 and accounted for one-half of the national increase in real R&D spending.

Overall, the U.S. constant-dollar investment in total R&D grew at an average annual rate of 3.9 percent during 1975-80. Although the rate of increase remained rather steady through 1982 (approximately 4 percent annually), the focus of the national R&D effort began to shift heavily toward defense-related activities in the early 1980s.[3] Largely as a result of increases in defense R&D, growth in real R&D expenditures accelerated to an average annual rate of 8.1 percent over 1982-85: Not since the spending initiative toward space exploration in the early 1960s had R&D in the United States grown so rapidly during any 3-year period. On average, from 1980 to 1985, R&D spending increased 6.6 percent per year in real terms.

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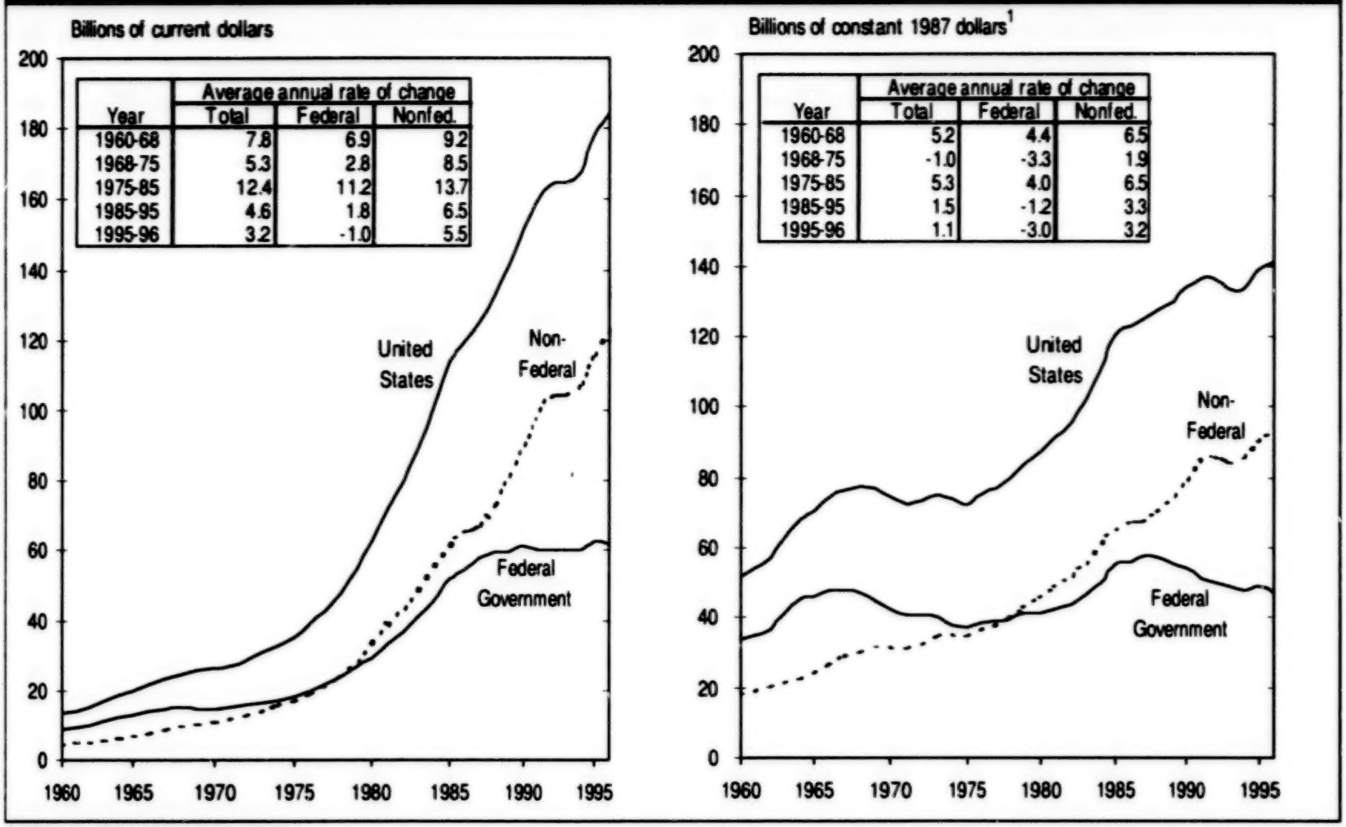
[1] For a discussion of how dollar amounts are adjusted for inflation in this report, see appendix A, section on "Controlling for Inflation and Foreign Currency."

[2] Expressions like "R&D growth *in 1996*" and "R&D growth *between 1995 and 1996*" are equivalent, because both measure the change in R&D from year-end 1995 to year-end 1996. When intervals are given, the comparison is made between year-end figures for the years mentioned, e.g., "R&D growth in 1990-1996" refers to the change from year-end 1990 to year-end 1996.

[3] Industry R&D expenditures on energy and pollution abatement also slowed at this time. In fact, in 1981 and 1982, such expenditures increased at only one-third the rate reported for the previous 4 years.

Chart 2. National R&D funding, by source: 1960-96



Billions of current dollars

Year	Average annual rate of change Total	Federal	Nonfed.
1960-68	7.8	6.9	9.2
1968-75	5.3	2.8	8.5
1975-85	12.4	11.2	13.7
1985-95	4.6	1.8	6.5
1995-96	3.2	-1.0	5.5

Billions of constant 1987 dollars[1]

Year	Average annual rate of change Total	Federal	Nonfed.
1960-68	5.2	4.4	6.5
1968-75	-1.0	-3.3	1.9
1975-85	5.3	4.0	6.5
1985-95	1.5	-1.2	3.3
1995-96	1.1	-3.0	3.2

[1] Based on GDP implicit price deflator.

NOTE: Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; table C-3

This pattern of a generally increasing rate of real R&D growth, however, changed abruptly in the mid-1980s. From 1985 to 1996, R&D spending slowed to a 1.4 percent annual real rate of increase, compared to a 2.6 annual real growth in GDP. Some slackening of both Federal and non-Federal funding of R&D as a proportion of GDP has contributed to this slowing. However, it is primarily the decline in real Federal R&D funding, as reported by R&D performers, that has contributed to the recent slowness of R&D growth.[4]

TRENDS IN FEDERAL SUPPORT

As a share of the national R&D total, Federal Government funding has continued to decline in recent years. Previously the primary provider of the Nation's R&D funds, the Federal Government's share of R&D funding first fell below 50 percent in 1978. From 1980 to 1988, the Federal Government accounted for between 45 and 47 percent of total R&D funding. The preliminary Federal R&D funding in 1996, $61.9 billion (chart 1), represents a 3 percent decline from the preliminary 1995 level in real terms. Consequently, the Federal Government's estimated share of R&D support for 1996, 33.6 percent, is the lowest recorded since the present data series began in 1953.[5]

Even with its declining share of the national total, Federal R&D funding grew from $41.4 billion in 1980 (in constant 1987 dollars) to a preliminary level of

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[4] In recent years, increasing differences have been detected in data on federally financed R&D as reported by Federal funding agencies, on the one hand, and by performers of the work (Federal labs, industry, universities, and other nonprofit organizations), on the other hand. This divergence in R&D totals is discussed in appendix A (and tables B-1 and B-2).

[5] The sample design for estimating industry R&D expenditures was revised for 1991 and later years. The effect of the change in industry's sample design was to reduce the Federal share of the national R&D total to 38 percent in 1991, down from the 41 percent share previously published for that year. See appendix A (and table B-4) for more information on these survey changes and their impact on R&D estimates.

$47.4 billion in 1996 (in constant 1987 dollars); i.e., it grew by roughly 0.9 percent per year in real terms during this period. The rate of increase was strongest in the early 1980s and accounted for most of the gain for the entire decade. From 1980 to 1985, Federal R&D funding grew, on average, by 5.9 percent in real terms annually. Support then slowed considerably in 1986, reflecting the budgetary constraints imposed on all Government programs, including those mandated by the Balanced Budget and Emergency Deficit Control Act of 1985 (also known as the Gramm-Rudman-Hollings Act) and subsequent legislation (notably the Budget Enforcement Act of 1990, which legislated that new spending increases be offset with specific spending cuts). Since then, Federal R&D data reflect the Government's growing emphasis on deficit reduction and a shift in the balance between defense and domestic programs. Consequently, real Federal R&D support has declined on average by 1.4 percent per year over the 1985-96 period, by preliminary calculations.

Practically all the gain in Federal R&D funding during the early 1980s was due to large increases in defense spending, as evidenced by the figures on the U.S. budget authority (chart 3). For example, defense activities of the Department of Defense (DOD) and the Department of Energy (DOE) accounted for roughly one-half of total Federal R&D budget authorizations in 1980.[6] By 1986, such defense-related spending peaked at 69 percent of the Federal R&D budget authority.

After 1986, Federal R&D spending priorities shifted—partially because of additional budgetary pressures, partially because of modifications in U.S. security measures in the international arena. Thus, the defense buildup in the early and mid-1980s was followed by a period of moderate reductions in the late 1980s; a leveling of R&D spending in the early 1990s;

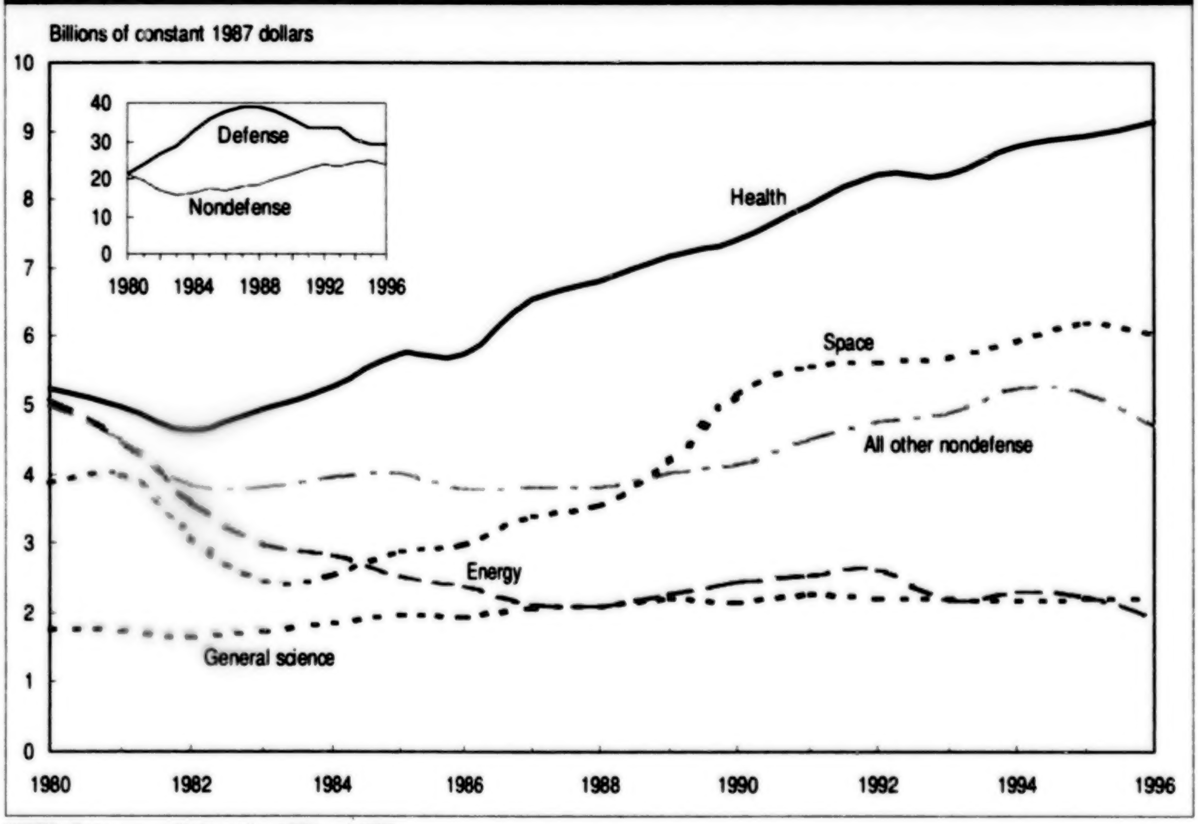

Chart 3. Federal R&D budget authority, by function: 1980-96

NOTE: Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; table C-23

and a return to planned, moderate reductions in the mid-1990s. Since 1986, the Federal budget authority for civilian-related R&D has grown faster than defense-related R&D. In particular, the budget allocation for health- and space-related R&D increased substantially between 1986 and 1996, with average real annual growth rates of 4.7 and 7.2 percent, respectively, using preliminary figures for 1996. The budget allocation for defense programs declined by an average real annual rate of 2.7 percent during the same period. As a result, in 1996, defense-related R&D accounts for an estimated 54.7 percent of the year's total Federal R&D budget authority, in contrast to 69.3 percent for 1986.

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[6] These percentage share calculations of defense-related R&D expenditures are based on Federal budget authorization totals, not on data reported by the performers of R&D.

Based on preliminary figures, R&D accounts for more than 14 percent of the Federal defense-related budget authority for 1996, and 3 percent of the Federal nondefense authority (table 1). In nondefense areas, R&D accounts for 69 percent of general science funds, nearly all of which (94 percent) is devoted to basic research (table 2). R&D accounts for 63 percent of funds for space research and technology, most of which (63 percent) is devoted to development. In total Federal health funding, R&D represents 11 percent, most of which ($6.4 billion out of $11.9 billion) is devoted to basic research (table 2), and nearly all of which (95 percent) is directed toward programs of the National Institutes of Health (NIH).

Federally funded R&D on energy actually exceeds the total Federal budget authority for all energy-related activities. This is because the Department of Energy, through the sale of assets in 1996, had substantially more funds to spend in that year than it received from the Federal budget. Consequently, federally funded energy R&D as a percentage of the total budget for energy-based activities in 1996 is 125.9 percent (table 1).

For the Nation as a whole, defense-related R&D climbed from 24.1 percent of the total R&D effort in 1980 to 31.7 percent in 1987. In 1996, defense-related R&D fell to 17.9 percent of total R&D expenditures, according to preliminary findings (chart 4). These shares by national objective represent a distribution of performer-reported R&D data. They are distinct from the budget authority shares reported above which are based on the various functional categories that comprise

Table 1. R&D as a percentage of Federal budget authority, by function: FY 1996

Budget function	R&D total (preliminary 1996)	Federal Total	R&D percentage share
	millions of current dollars		
Total	69,069	1,571,597	4.4
On budget	69,069	1,263,491	5.5
National defense	37,791	263,308	14.4
Nondefense (on-budget)	31,279	1,000,183	3.1
Health	11,902	110,867	10.7
Space research and technology	7,871	12,543	62.8
Energy	2,504[1]	1,989[1]	125.9[1]
General science	2,862	4,166	68.7
Natural resources and environment	1,877	20,669	9.1
Transportation	1,752	37,118	4.7
Agriculture	1,178	6,935	17.0
All other	1,334	805,896	0.2

[1] R&D is greater than total budget authority because of offsetting receipts from sales of the Strategic Petroleum Reserve, which reduced total budget authority. Includes budget-authority from mandatory spending.

NOTES: Because of rounding, components may not add to the totals shown. Data are derived from the administration's 1997 budget proposal. On-budget totals are for all Federal Government transactions except those of the social security trust funds (Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds) and the Postal Service.

SOURCES: National Science Foundation/SRS, and Office of Management and Budget

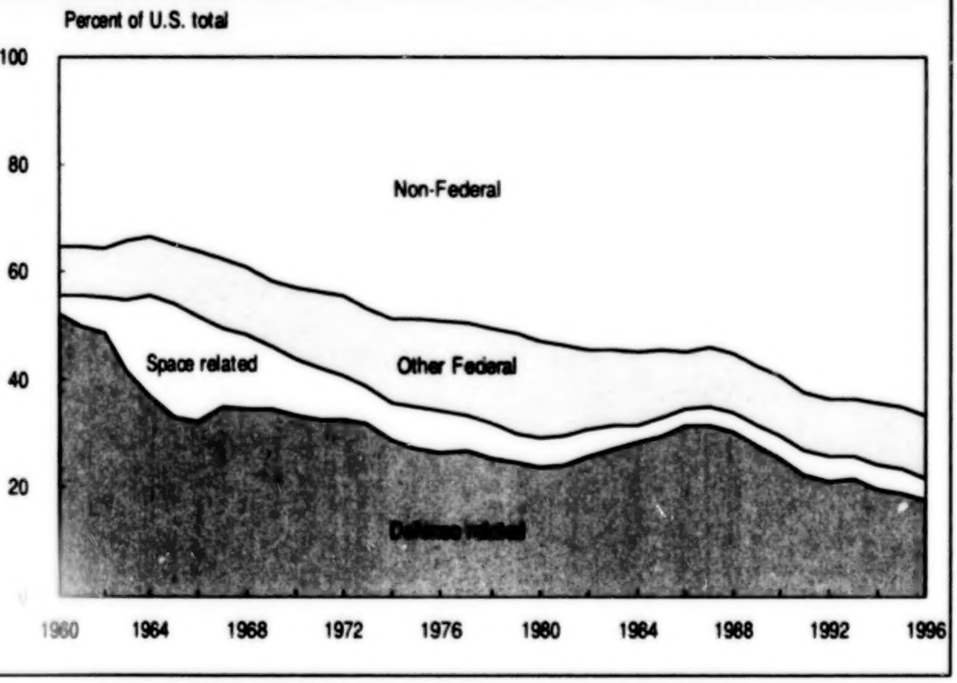
Table 2. Budget authority for R&D by function and character of work: Preliminary FY 1996

Budget function	Basic Research	Applied Research	Development	R&D Total
	millions of current dollars			
Total	14,431	13,763	40,875	69,069
National defense	1,204	3,746	32,840	37,791
Nondefense (total)	13,228	10,016	8,035	31,279
Health	6,442	4,064	1,396	11,902
Space research and technology	1,563	1,322	4,986	7,871
Energy	1,222	522	760	2,504
General science	2,685	177	0	2,862
Natural resources and environment	179	1,419	279	1,877
Transportation	366	1,123	264	1,752
Agriculture	556	557	65	1,178
All other	216	833	285	1,334

NOTES: Because of rounding, components may not add to the totals shown.

SOURCES: National Science Foundation/SRS, *Federal R&D Funding by Budget Function: Fiscal Years 1995-97* NSF 97-301, and unpublished tabulations

Chart 4. R&D spending as a percent of total, by national objective and source: 1960-96



NOTES: Data are preliminary for 1995 and 1996. Details may not sum to totals because of rounding.

SOURCE: National Science Foundation/SRS; table C-14

the Federal budget. (See appendix A.) Between 1982 and 1996, space-related R&D funding has annually accounted for between 3 and 5 percent of the national R&D total.

With regard to "civilian-related" R&D (nondefense-nonspace programs), Federal funding accounts for 11.7 percent of total R&D (Federal and non-Federal) in 1996, by preliminary calculations (table C-14). This percentage is not much higher than it was in 1993, 10.6 percent, which was the lowest it had been since 1962. Such federally supported, civilian-related R&D as a percentage of all U.S. R&D reached a peak of 18.6 percent in 1979, but has remained relatively constant—between 10 and 12 percent—since 1986.

Preliminary estimates of Federal R&D obligations for 1996 indicate that seven Federal agencies have R&D obligations of over $1 billion: DOD, DOE, the Department of Health and Human Services (HHS), the National Aeronautics and Space Administration (NASA), NSF, and the Departments of Agriculture and Commerce. DOD has the largest share (49 percent) of Federal R&D obligations ($33.7 billion), followed by HHS (17.2 percent), NASA (11.8 percent), DOE (9.9 percent), NSF (3.3 percent), Department of Agriculture (2.0 percent), and Department of Commerce (1.9 percent) (table 3).

In contrast to total R&D obligations, only three agencies have intramural R&D expenditures that exceed $1.0 billion in 1996, including costs associated with planning and administering extramural R&D programs: DOD, HHS (which includes NIH), and NASA.[7] These three agencies together account for 77.9 percent of all Federal R&D obligations for 1996, and 75.0 percent of Federal intramural R&D.

TRENDS IN NON-FEDERAL SUPPORT

Concurrent with the 1980-85 gains in Federal R&D spending, R&D support from non-Federal sources also grew substantially—by 7.2 percent per year after inflation during this period. However, between 1985 and 1996, by preliminary calculations, growth of non-Federal real R&D funding slowed considerably, to an average annual rate of 3.3 percent.

Most non-Federal R&D support is provided by industry. Of the projected 1996 non-Federal total ($122.4 billion in current dollars), 92.7 percent ($113.5 billion) is company funded. This level of industry funding represents a real increase of 3.5 percent over its 1995 level. Industry's share of national R&D funding had first surpassed that of the Federal Government in 1980, and it has remained higher ever since. From 1980 to 1985, industrial support for R&D grew, in real terms, at an average annual rate of 7.3 percent. This growth was maintained through both the mild 1980 recession and the more severe 1982 recession (chart 5). Key factors behind increases in industrial R&D included a growing concern with international competition, especially in high-technology industries; the increasing technological sophistication of products, processes, and services; and general growth in defense-related industries such as electronics, aircraft, and missiles.

Between 1985 and 1994, growth in R&D funding by industry was much slower than previously, averaging only 2.8 percent per year in real terms. The growth in industrial R&D funding was only slightly greater than the growth of the economy (2.5 percent) over the same period in terms of real GDP. However, on the basis of preliminary figures for 1995 and 1996, industrial R&D support from 1994 to 1996 grew, in real terms, by 4.8 percent per year, compared with a 3.0 percent real annual growth in the economy over the same period.

While these figures indicate general trends, as an examination of the industrial sector in the aggregate, they reveal little about the underlying factors influencing R&D performance or support, because R&D budget decisions vary substantially across different industries. Thus, trends in industrial R&D may be as

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[7] Estimates are for FY 1996 Federal intramural obligations as reflected in the administration's 1997 budget proposal (see appendix A) and cover costs associated with planning and administering intramural and extramural R&D programs by Federal personnel as well as actual intramural R&D performance. See NSF, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996*, NSF 94-328 (Arlington, VA, 1996).

Table 3. Preliminary Federal R&D obligations, total and intramural by agency: FY 1996

Agency	Total R&D obligations (millions of current dollars)	Total R&D obligations as a percent share of Federal total	Intramural R&D (millions of current dollars)	Percent of Agency R&D obligations that are intramural[1]	Percent change in real intramural R&D from previous year[2]
Department of Defense	33,706.0	48.96	7,848.2	23.3	-11.8
Department of Health & Human Services[3]	11,828.2	17.18	2,345.4	19.8	1.1
National Aeronautics & Space Administration	8,105.7	11.77	2,026.4	25.0	-7.3
Department of Energy	6,842.3	9.94	706.7	10.3	11.4
National Science Foundation	2,303.1	3.35	22.6	1.0	7.1
Department of Agriculture	1,393.1	2.02	937.9	67.3	-1.2
Department of Commerce	1,325.8	1.93	741.8	56.0	9.7
Department of Transportation	710.1	1.03	244.1	34.4	18.5
Department of the Interior	683.2	0.99	595.9	87.2	-1.6
Environmental Protection Agency	676.4	0.98	150.7	22.3	13.6
Department of Veterans Affairs	258.0	0.37	256.0	99.2	-2.6
Agency for International Development	222.0	0.32	25.4	11.4	-39.8
Department of Education	188.3	0.27	8.9	4.7	3.9
Smithsonian Institution	129.2	0.19	129.2	100.0	1.2
Tennessee Valley Authority	103.4	0.15	103.4	100.0	8.9
Nuclear Regulatory Commission	81.8	0.12	12.8	15.6	-2.7
Department of Labor	67.2	0.10	10.1	15.0	0.1
Department of Justice	53.5	0.08	14.3	26.7	-16.0
Department of the Treasury	52.8	0.08	43.9	83.1	2.0
Department of Housing & Urban Development	42.5	0.06	21.5	50.6	-13.9
Social Security Administration[3]	37.2	0.05	16.0	43.0	NA
US International Trade Commission	10.8	0.02	10.8	100.0	3.8
Library of Congress	9.7	0.01	9.7	100.0	-1.9
Department of State	5.4	0.01	0.4	7.4	-1.9
Other Agencies[4]	7.0	0.01	5.3	75.7	-3.7
Entire Federal Government[5]	68,842.4	100.00	16,287.3	23.7	-5.8

[1] Intramural activities include actual intramural R&D performance and the costs associated with the planning and administration of both intramural and extramural programs by Federal personnel. For the definition of intramural performers, see Definitions for Classification and Measurement, in Appendix A.

[2] Based on fiscal year GDP implicit price deflators for 1995 and 1996 (Table C-1).

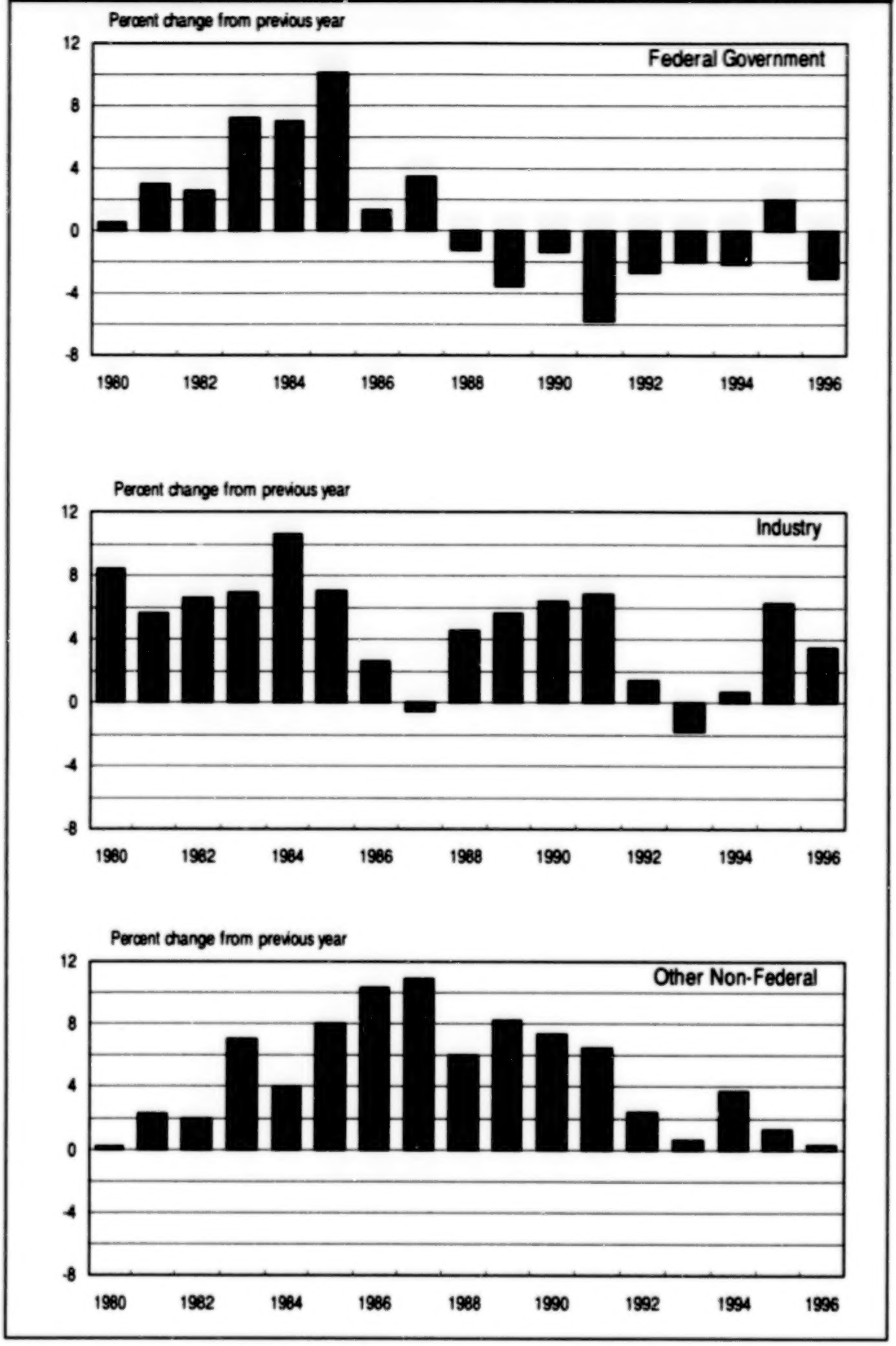
[3] As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services.

[4] Includes: Advisory Commission on Intergovernmental Relations, Appalachian Regional Commission, Consumer Product Safety Commission, Federal Communications Commission, Federal Trade Commission, National Archives and Records Administration, US Arms Control and Disarmament Agency, and US Information Agency.

[5] Numbers do not total exactly, due to rounding.

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996

Chart 5. Annual changes in national R&D spending, by source of funds: 1980-96 (based on constant 1987 dollars)



NOTE: Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; table C-3

much dependent on specific factors affecting specific industries within the economy as they are dependent on global factors that affect all industries as a whole.

Companies with the largest annual growth in real R&D performance from non-Federal sources between 1984 and 1994 have been in the following industrial sectors: nonmanufacturing[8] (18.1 percent); chemicals and allied products, rubber products, and other manufacturing industries[9] (each slightly more than 4.4 percent); and paper and allied products (slightly under 4.4 percent). Those industries experiencing the greatest annual declines (negative growth) in R&D over the same period were: stone, clay, and glass products (-5.5 percent); machinery (-4.7 percent); petroleum refining and extraction (-4.6 percent); and primary metals (-3.4 percent) (table 4).

National R&D funding from other non-Federal sectors—namely academic and other nonprofit institutions, including the support they receive from State and local governments—has been generally more consistent over time. It grew at an average annual real rate of 4.6 percent between 1980 and 1985, and, by preliminary calculations, 5.2 percent between 1985 and 1996. The projected $9.0 billion in funding in 1996 is virtually unchanged in real terms (only 0.3 percent higher) from its 1995 level. Most of these R&D dollars are used for research within the academic sector.

Table 4. Change in non-federal funds for industrial R&D, by industry: 1984-94

Industry	SIC code(s)	R&D in millions of current dollars		Average annual growth in real R&D (percent)
		1984	1994	
Nonmanufacturing industries[1]	--	3,252	23,756	18.09
Chemicals and allied products	28	7,736	16,559	4.44
Rubber products	30	671	1,432	4.41
Other manufacturing industries	27,31,39	373	796	4.41
Paper and allied products	26	594	1,263	4.37
Professional and scientific instruments	38	4,211	8,058	3.28
Textiles and apparel	22,23	182	316	2.28
Transportation equipment	37	10,406	17,695	2.07
Electrical equipment	36	9,037	13,537	0.78
Lumber, wood products, and furniture	24,25	143	201	0.14
Food, kindred, and tobacco products	20,21	1,081	1,476	-0.15
Fabricated metal products	34	773	868	-2.08
Primary metals	33	683	672	-3.37
Petroleum refining and extraction	13,29	2,245	1,939	-4.62
Machinery	35	9,312	8,011	-4.66
Stone, clay, and glass products	32	705	553	-5.53

[1] The definition of this group in terms of the SIC codes it includes changes between 1990 and 1991, limiting the usefulness of comparing 1984 and 1994 figures. (See table C-30.)

Sources: National Science Foundation/SRS; derived from tables C-1 and C-30

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[8] See appendix A, section on "Use of 'Nonmanufacturing' as a Single Industrial Category." Also note that, as a result of recent improvements (since 1992) in the NSF sampling of firms located in the service sector, it is not clear to what extent the nonmanufacturing sector has rapidly expanded its share of the Nation's R&D, or how much of the apparent increase is due solely to improved measurement techniques.

[9] These include companies in Standard Industrial Classification Codes 27, 31, and 39, which are, respectively: printing, publishing, and allied industries; leather and leather products; and miscellaneous manufacturing industries (e.g., jewelry, musical instruments, toys, pens, burial caskets, and scenery for theaters).

MEASURES AND COMPARISONS OF NATIONAL RESOURCES FOR R&D

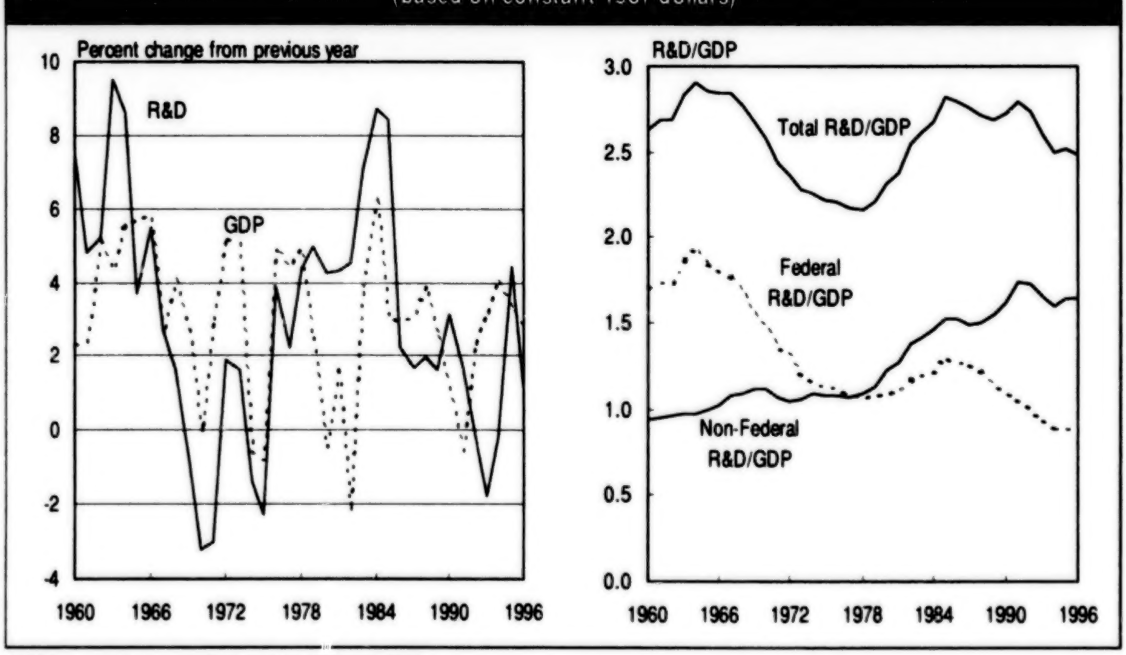
This section examines two indicators of R&D spending: (1) the ratio of total R&D expenditures to GDP and (2) the ratio of Federal funds expended for R&D to total Federal funds. Also presented is a comparison of U.S. R&D resources with those of other countries. These measures and comparisons show that the U.S. commitment to R&D seems to have plateaued during the past decade. Relative to the increases of its major international competitors, the U.S. R&D effort has eroded slightly, although many of these countries are also now experiencing a reduction in their R&D expenditures.

U.S. R&D/GDP RATIO

Growth in R&D expenditure should be examined in the context of the overall growth of the economy during the same period, given the significance of such factors as population growth, capital accumulation, and technological advancement. The ratio of R&D expenditures to GDP may be used as a measure of the Nation's commitment to R&D. In 1996, total U.S. support for R&D is expected to reach $184.3 billion. This sum represents 2.48 percent of estimated GDP— $7.428 trillion—slightly lower than the preliminary 1995 percentage of 2.52 (table C-15).

A review of U.S. R&D expenditure as a percentage of GDP over time shows an initial low of 1.38 percent in 1953 at the start of the time series, rising to a peak of 2.91 percent in 1964, followed by a gradual decline to 2.16 percent in 1978. The current expected ratio of 2.48 for 1996 is the lowest it has been since 1981, and reflects a downward trend since 1991. The initial drop in the R&D/GDP ratio from its 1964 peak largely reflected Federal cutbacks in defense and space R&D programs, although gains in energy R&D activities between 1975 and 1979 resulted in a relative stabilization of the ratio at around 2.2 percent. Over the entire 1965-78 period, the annual percentage increase in real R&D was less than the annual percentage increase in real GDP (chart 6).

Chart 6. Annual changes in GDP and R&D, and the R&D GDP ratio: 1960-96
(based on constant 1987 dollars)



NOTE: Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; tables C-1 and C-15

From 1978 to 1985, the R&D/GDP ratio increased steadily from 2.16 to 2.82 percent. This increase was as much due to a slowdown in GDP growth as to increased spending on R&D activities. For example, the 1980 and 1982 recessions resulted in a slight decline in real GDP with no corresponding reduction in R&D spending. In contrast, during previous recessions, changes in funding for R&D tended to match or exceed the adverse movements of the broader economy.

Since 1985, the R&D/GDP ratio has exhibited a downward trend, due to declining growth in Federal R&D expenditures and slow-to-declining growth in non-Federal R&D expenditures.[10] In the 11 years from 1985 to 1996, real GDP grew by 2.6 percent per year, while R&D grew by only 1.4 percent.

U.S. FEDERAL R&D FUNDS/ TOTAL BUDGET RATIO

One way to gauge the Government's priority for R&D is to compare Federal outlays for R&D with Federal outlays for all purposes.[11] Total Federal outlays (for on-budget programs only) for 1996 are estimated at $1.27 trillion.[12] R&D is expected to account for 5.3 percent ($67.7 billion) of those total outlays (chart 7 and appendix table C-24).

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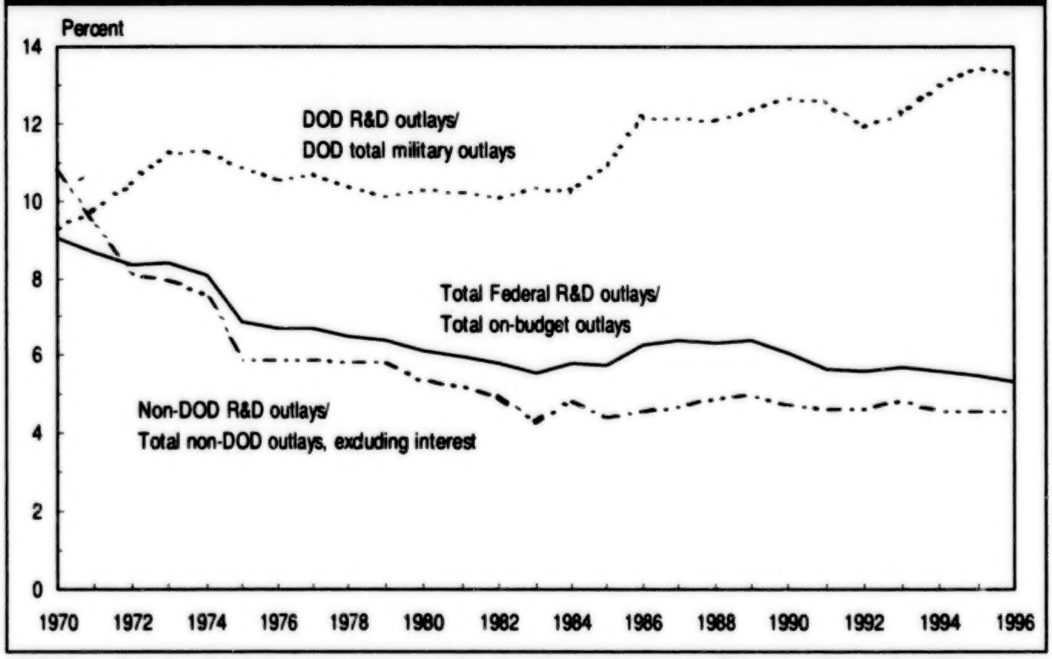
[10] See appendixes A and B for explanations and summary statistics detailing the effects on the U.S. R&D/GDP ratios from recent changes in the NSF survey of industry R&D performance.

[11] This idea is applicable in most years. However, in some years, Federal outlays for purposes other than R&D may reflect extenuating circumstances such as a major war rather than "the Government's priority for R&D."

[12] Almost all off-budget receipts and disbursements are for social security programs (the Federal Old-Age and Survivors Insurance and the Federal Disability Insurance trust funds) which are excluded from the budget totals by the Balanced Budget and Emergency Deficit Control Act of 1985. Preliminary off-budget outlays for FY 1996, as provided in the President's 1997 budget proposal, are $302 billion (in current dollars). See Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1997* (Washington, DC: U.S. Government Printing Office, 1996).

Chart 7. Ratio of Federal R&D outlays to total budget outlays: 1970-96



NOTES: Excludes off-budget outlays, which are mostly for social security programs. Data are preliminary for 1995 and 1996. DOD R&D outlays are not strictly comparable to "defense R&D", as they do not include Department of Energy (DOE) atomic weapons R&D.

SOURCES: National Science Foundation/SRS, Department of Commerce, and Office of Management and Budget; table C-24.

From 1970 to 1983, R&D outlays as a percentage of total outlays declined steadily—especially during the early 1970s—dropping from 9.0 to 5.5 percent. This trend was dominated by a sharp fall in nondefense R&D outlays as a proportion of all nondefense outlays (excluding interest on the national debt), which declined from 10.7 percent in 1970 to 4.3 percent in 1983. The declining share of nondefense R&D was not confined to one or two agencies but was a result of both slow growth in most non-DOD agencies' R&D outlays and a relatively rapid expansion of the non-R&D component of the Federal budget for civilian agencies. In contrast, throughout the same period, R&D conducted by the Defense Department as a proportion of total DOD outlays went from a low of 9.3 percent in 1970, to a peak of 11.3 percent in 1974, to 10.3 percent by 1983.

After 1983, the percentage of all Federal outlays devoted to R&D first moved up and then back down. The ratio peaked at 6.4 percent in each year of the 1987-89 period, but has dropped steadily since then to a preliminary level of 5.3 percent in 1996. Most of the increases in Federal R&D/total outlays in 1984-86 were due to relatively large increases in DOD R&D outlays. Before 1990, this increase in DOD R&D was not offset by the relative decline in non-DOD R&D—as had been the case in the 1970s—or by the growing share of the Federal budget for interest payments.[13] In the 1990s, the declining R&D outlay ratio can be attributed to a relative decrease in non-DOD R&D as a proportion of non-DOD, non-interest, outlays. Concurrently, however, R&D has taken on relatively increasing importance in a shrinking DOD budget.

INTERNATIONAL COMPARISONS

Given the size of its economy, the United States spends more money on R&D activities than does any other country. In fact, it spends more than Japan, Germany, France, and the United Kingdom combined (appendix table C-21). Yet from 1990 to 1994, total R&D expenditures stagnated or declined in the United States, Japan, Germany, France, the United Kingdom, and Italy. Indeed, for more than a decade, these countries have displayed similar aggregate R&D trends: substantial inflation-adjusted R&D growth in the early 1980s, followed by a general tapering off in the late 1980s, and then level or declining real R&D expenditures into the 1990s. For most of these countries, economic recessions and budgetary constraints had the effect of slowing both industrial and government sources of R&D support. In particular, both factors contributed to major reversal of R&D trends in Japan, where R&D spending declined recently after experiencing inflation-adjusted gains of about 8 percent annually during the previous decade. The same is true for the United Kingdom and Italy, where real growth in the 1980s gave way to declining R&D expenditures thereafter (chart 8).

Additionally, geopolitical changes have resulted in cutbacks in government support for defense-related R&D that, in turn, have reduced reported national R&D growth patterns in some countries—most notably, the United States and France. For Germany, the integration of the former East German science and technology system into that of West Germany's market economy resulted in an apparent jump in the nation's R&D effort in 1991. This growth, however, was subsequently scaled back in an effort to restructure and close unnecessary research institutions.[14]

R&D/GDP RATIOS

The R&D/GDP ratio discussed above can be used to determine the relative emphasis placed on R&D activities by the United States and other countries, which is not directly related to the size of their economies. Use of this ratio bypasses many of the problems in interpretation caused by inflation, exchange-rate fluctuations, different unit costs, and variations in the volume of research efforts. Caution must nonetheless be exercised in making even these international comparisons, because each country measures its R&D somewhat differently.

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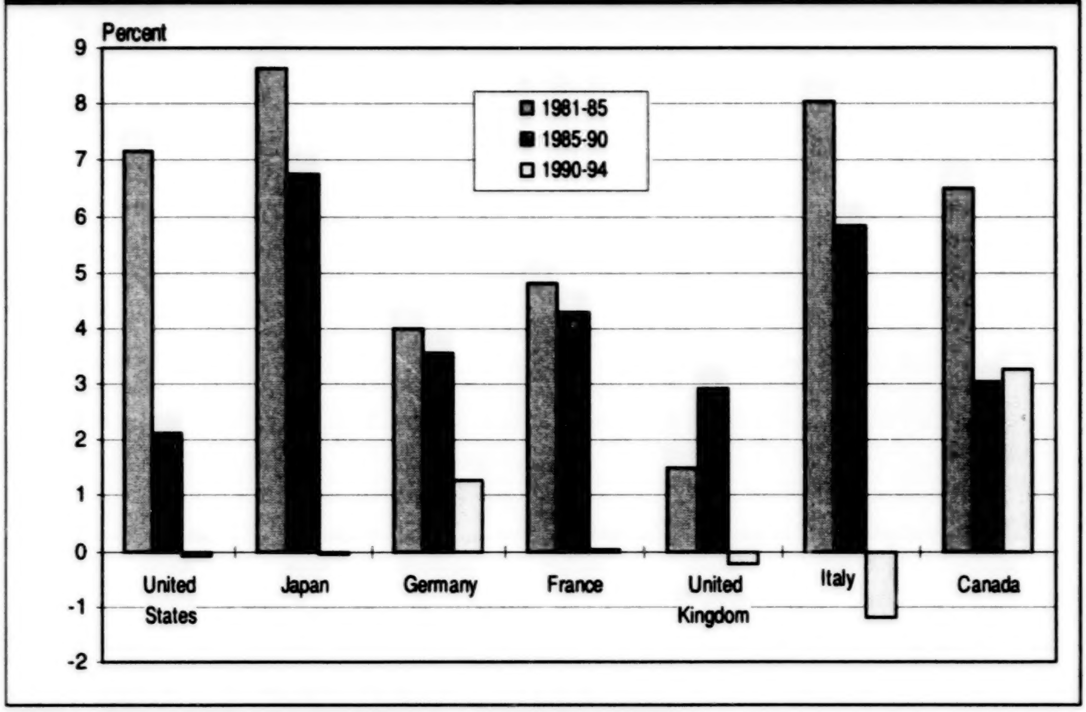
[13] As a percentage of total Federal on-budget outlays, interest payments on the national debt rose from 13.8 percent in 1983 to 19.4 percent in 1989. In 1996, the preliminary share of on-budget outlays for interest payments is 21.8 percent (see table C-24).

[14] For more detailed discussion of these changes, see National Science Board, *Science & Engineering Indicators—1996*, NSB 96-21 (Washington, DC: U.S. Government Printing Office, 1996).

Chart 8. Annual rates of change in real R&D spending, by selected countries



NOTE: Rates of average annual change based on inflation-adjusted currencies.

SOURCE: National Science Foundation/SRS; table C-21

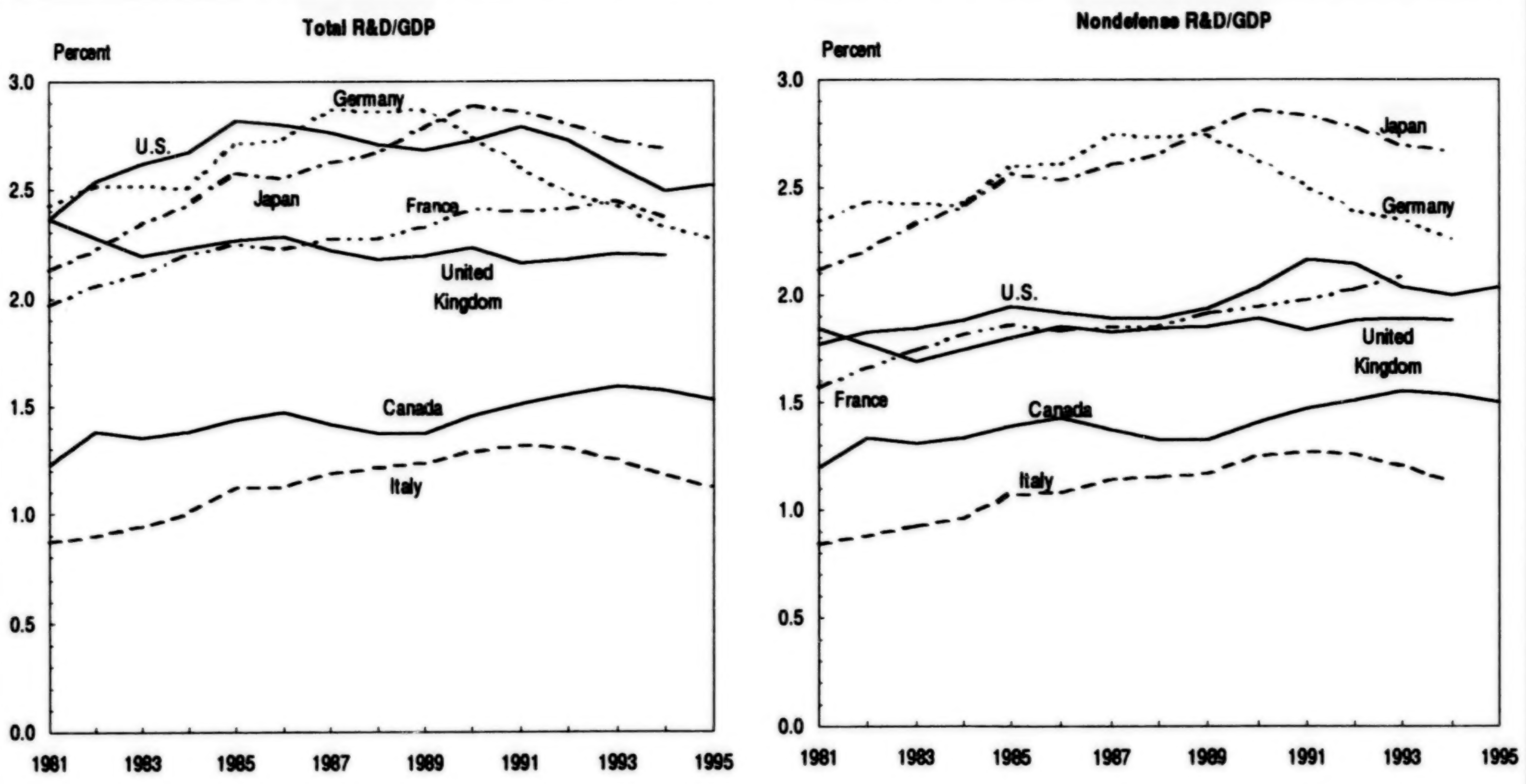
In 1994—the latest year for which foreign data are available—the United States spent 2.49 percent of its GDP on R&D. In comparison, Japan spent 2.69 percent of its GDP; France, 2.38 percent; Germany, 2.33 percent; the United Kingdom, 2.19 percent; Canada, 1.57 percent; and Italy, 1.19 percent.

During the early to mid-1960s, the United States ranked highest among these countries in terms of R&D/GDP ratio. After 1964, however, the U.S. ratio began to decline, as Federal R&D spending for defense and space was cut back and the U.S. GDP continued to increase. At the same time, the ratios of other countries—notably (West) Germany and Japan—slowly increased. These trends continued until the late 1970s, when the U.S. ratio had dropped to 2.2 percent and was roughly equal to those of (West) Germany, the United Kingdom, and Japan.

From the late 1970s through the early 1980s, the ratios in all of the industrialized countries just mentioned, with the exception of the United Kingdom, were again increasing. By 1985, they had reached 2.82 percent for the United States, 2.72 percent for (West) Germany, 2.58 percent for Japan, 2.27 percent for the United Kingdom, and 2.25 percent for France (appendix table C-21). These ratios have fluctuated within narrow ranges since 1985. Japan's ratio peaked at 2.89 percent in 1990 and then dipped back to 2.69 percent in 1994 (chart 9). The ratio for Germany peaked at 2.88 percent in 1987 but has since declined to 2.33 percent in 1994—a result, in part, of the reunification of Germany and its subsequent effects on official statistics. The R&D/GDP ratio for France rose continually from 1.97 percent in 1981 to 2.45 percent in 1993, but in 1994 fell to 2.38 percent. The United Kingdom's ratio remained between 2.16 and 2.29 during the period 1983-94. As previously noted, the U.S. ratio fell continually after a peak of 2.82 percent in 1985, as a result of declining defense R&D funding (appendix tables C-21 and C-22).

The separation of R&D into defense and nondefense components allows for an examination of the ratio of nondefense R&D to total GDP. In 1994, the most recent year for complete data, the United States had a

Chart 9. R&D expenditures as a percentage of GDP, by country: 1981-95



SOURCE: National Science Foundation/SRS; tables C-21 and C-22 nondefense R&D/GDP of 2.0 percent. Compared with the industrialized countries under discussion, the United States ranks fourth in terms of nondefense R&D/GDP, below Japan (2.7 percent), Germany (2.3 percent), and France (2.1 percent),[15] but above the United Kingdom (1.9 percent), Canada (1.5 percent), and Italy (1.1 percent) (chart 9). Roughly 80 percent of the U.S. R&D effort in 1994 was devoted to nondefense activities, as compared with 99 percent for Japan.

R&D SCIENTISTS AND ENGINEERS/ LABOR FORCE RATIOS

Another useful measure for international comparisons is the number of R&D scientists and engineers in a country as a proportion of its total labor force. The estimated number of scientists and engineers employed in full-time-equivalent (FTE) R&D jobs as a proportion of the total labor force is higher in the United States and Japan than in the other industrialized market economies under discussion. For the United States, FTE R&D scientists and engineers has tended to rise steadily—with minor fluctuations—from approximately 0.55 percent of the labor force in 1976 to 0.76 percent in 1991. However, in 1993, the most recent year for which complete data are available, the number fell slightly to 0.74 percent, or 74 S&Es per 10,000 labor force (chart 10).

In 1993, for the first time in recent history, Japan exceeded the United States in the proportion of all employees that are R&D S&Es—0.80 percent in Japan compared to 0.74 percent in the United States. This difference in the R&D S&E ratio between the United States and Japan is in sharp contrast to earlier values. For example, in 1981, the proportions were 0.62 for the United States and 0.55 for Japan.[16] France and Germany also experienced significant increases in this proportion between 1981 and 1993: from 0.36 percent to 0.58 percent, and from 0.44 percent to 0.59 percent, respectively. In Canada, R&D S&Es increased from 0.34 percent of the labor force in 1981 to 0.47 percent in 1991. In contrast, the United Kingdom and Italy show relatively smaller growth in this percentage. Overall, U.S. leadership in terms of the highest proportion of R&D S&Es in the labor force no longer holds, and is continuing to deteriorate in relation to other industrialized nations.

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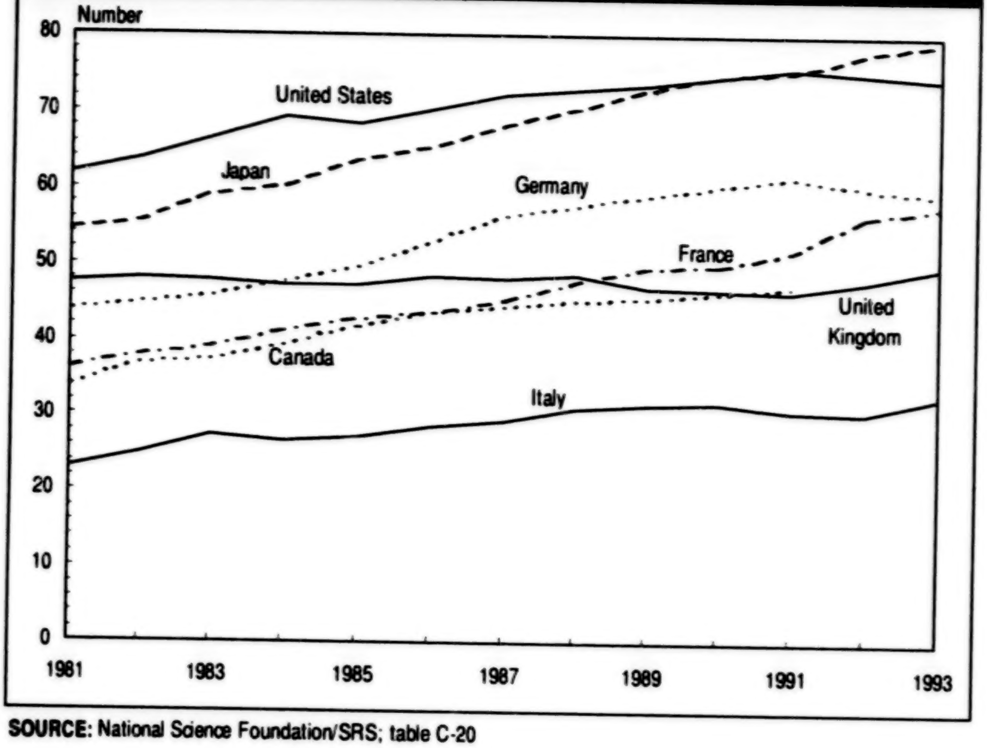
[15] For France, the 1993 ratio is cited, as the 1994 figure was not yet available.

[16] Japanese and U.S. surveys on the number of scientists and engineers engaged in R&D are not strictly comparable. Estimates for most of the U.S. data are adjusted to capture full-time equivalence; Japanese surveys, on the other hand, ask for the total number of S&Es engaged in R&D regardless of the amount of time devoted to R&D. Japanese data on scientists and engineers exclude those engaged in R&D in the social sciences. The U.S. data exclude such personnel from the industry sector alone. The historical series for these U.S. personnel data was revised in this *National Patterns*. Data for 1985 and later years are not directly comparable with the data for 1984 and earlier years. See appendix A for a review of these changes.

Chart 10. Scientists and engineers engaged in R&D per 10,000 labor force, by country: 1981-93



SOURCE: National Science Foundation/SRS; table C-20

NATIONAL R&D PERFORMANCE PATTERNS—BY SECTOR

The sectoral shares of U.S. R&D performance, measured in terms of expenditures, have shifted slightly during the past decade. In 1980, industry performed 71 percent of the Nation's R&D; the academic sector—including FFRDCs administered by universities—accounted for 13 percent; the Federal Government, 12 percent; and the nonprofit sector, 3 percent. As industry's defense-related R&D efforts accelerated in the early 1980s, its share of the performance total rose to a 1985 peak of 74 percent. Based on preliminary estimates for 1996, academic R&D performance now represents 12.2 percent of the U.S. total, Federal intramural R&D performance 8.8 percent, other nonprofit organizations 3.3 percent, and private industry 72.8 percent, leaving university-administered FFRDCs with 2.9 percent of the total (table 5).[17]

From 1985 to 1996, R&D performance, in real-dollar expenditures, grew by 1.4 percent per year for all sectors combined, based on preliminary calculations for 1996. This growth was not evenly balanced across sectors: R&D performance at universities and colleges (excluding FFRDCs) grew by 4.8 percent per year in real terms, compared with growth of 2.3 percent per year for nonprofit organizations, 1.3 percent growth for industry, growth of 0.9 percent per year for academic FFRDCs, and a decline of 0.9 percent per year for Federal intramural performance.

INDUSTRY

R&D performance by private industry will reach a projected $134.2 billion in 1996, which includes $2.1 billion spent by FFRDCs administered by industrial firms. This total represents a 2.0 percent real increase over the 1995 preliminary total (chart 11). That 1995 total of $128.7 billion in current dollars reflects a much larger real gain of 5.9 percent over the previous year—the largest percentage gain in real industrial R&D performance since 1985.

In 1996, R&D performed by industry that was not federally supported but financed almost entirely by companies themselves is 3.5 percent higher in real terms than its 1995 level, according to preliminary data. Overall, these data imply that private companies will fund approximately 83 percent ($111.0 billion) of their 1996 R&D performance, with the Federal Government funding nearly all the rest ($23 billion, or 17 percent of total). Preliminary figures also indicate a 4.2 percent fall, in real terms, in Federal funds for industrial R&D activities between 1995 and 1996. As recently as 1987, the Federal funding share of industry's performance total was 33 percent; however, this Federal share has been steadily declining since its 1959 peak of 59 percent .

Individual industries show very different R&D performance trends and shares of the industry R&D total since the early 1980s. R&D performance by manufacturers of aircraft and spacecraft/guided missiles manufacturers (Standard Industrial Classification—SIC—codes 372 and 376, respectively) has been the most volatile, representing, for example, 25 percent of total industry R&D performance in 1988, but only 12 percent in 1994 (table 6). These movements can be partially explained by parallel shifts in Federal defense-related funding during the period. Overall, the greatest rates of annual growth in real R&D performance observed recently occurred in SIC code 283, drugs and medicines (9 percent), SIC codes 381-382, scientific and mechanical measuring instruments (20 percent), and "nonmanufacturing industries" (16 percent).[18] In this latter catch-all category, R&D activity is concentrated in nonmanufacturing firms whose primary activity involves communications services and computer-related and engineering services.

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[17] The industry and nonprofit sectors' performance totals reported here include R&D performed by FFRDCs administered by organizations in their respective sectors. However, in table C-2, R&D expenditures for these FFRDCs are reported separately.

[18] These rates are based on growth between 1984 and 1994, or between years within that interval for which data were available. The growth rate of R&D performance for drugs and medicines was based on a comparison of 1986 and 1994 real levels, since data were not available for 1984-85. Similarly, the growth calculation for scientific and mechanical measuring instruments used 1988 and 1994 data. Growth for nonmanufacturing industries was based on 1984 and 1994 levels. (See table C-29 for R&D performance in current dollars, and C-1 for deflators.)

Table 5. Projected levels of intersectoral transfers of funds for performance of R&D: 1996

Character of Work / Sources of Funds	Federal Government	Industry[1]	Universities and colleges	U&C associated FFRDCs[2]	Other nonprofit institutions[1]	Total	Percent distribution by sources
	[millions of current dollars]						
TOTAL R&D							
Federal Government	16,200	23,200	13,400	5,400	3,700	61,900	33.6%
Industry	--	111,000	1,600	--	850	113,450	61.6%
Universities and colleges	--	--	5,800	--	--	5,800	3.1%
Other nonprofit institutions	--	--	1,600	--	1,550	3,150	1.7%
Total	16,200	134,200	22,400	5,400	6,100	184,300	100.0%
Percent distribution, performers	8.8%	72.8%	12.2%	2.9%	3.3%	100.0%	
BASIC RESEARCH							
Federal Government	2,500	900	9,500	3,000	1,250	17,150	57.6%
Industry	--	6,000	1,000	--	390	7,390	24.8%
Universities and colleges	--	--	3,600	--	--	3,600	12.1%
Other nonprofit institutions	--	--	1,000	--	620	1,620	5.4%
Total	2,500	6,900	15,100	3,000	2,260	29,760	100.0%
Percent distribution, performers	8.4%	23.2%	50.7%	10.1%	7.6%	100.0%	
APPLIED RESEARCH							
Federal Government	4,900	4,300	2,850	1,000	1,050	14,100	36.4%
Industry	--	21,000	500	--	290	21,790	56.2%
Universities and colleges	--	--	1,800	--	--	1,800	4.6%
Other nonprofit institutions	--	--	500	--	560	1,060	2.7%
Total	4,900	25,300	5,650	1,000	1,900	38,750	100.0%
Percent distribution, performers	12.6%	65.3%	14.6%	2.6%	4.9%	100.0%	
DEVELOPMENT							
Federal Government	8,800	18,000	1,050	1,400	1,400	30,650	26.5%
Industry	--	84,000	100	--	170	84,270	72.8%
Universities and colleges	--	--	400	--	--	400	0.3%
Other nonprofit institutions	--	--	100	--	370	470	0.4%
Total	8,800	102,000	1,650	1,400	1,940	115,790	100.0%
Percent distribution, performers	7.6%	88.1%	1.4%	1.2%	1.7%	100.0%	

[1] Expenditures for FFRDCs administered by both industry and nonprofit institutions are included in the totals of their respective sectors. They are estimated to account for less than 2 percent and 15 percent, respectively, of the industry and nonprofit institutions performance totals. FFRDCs are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

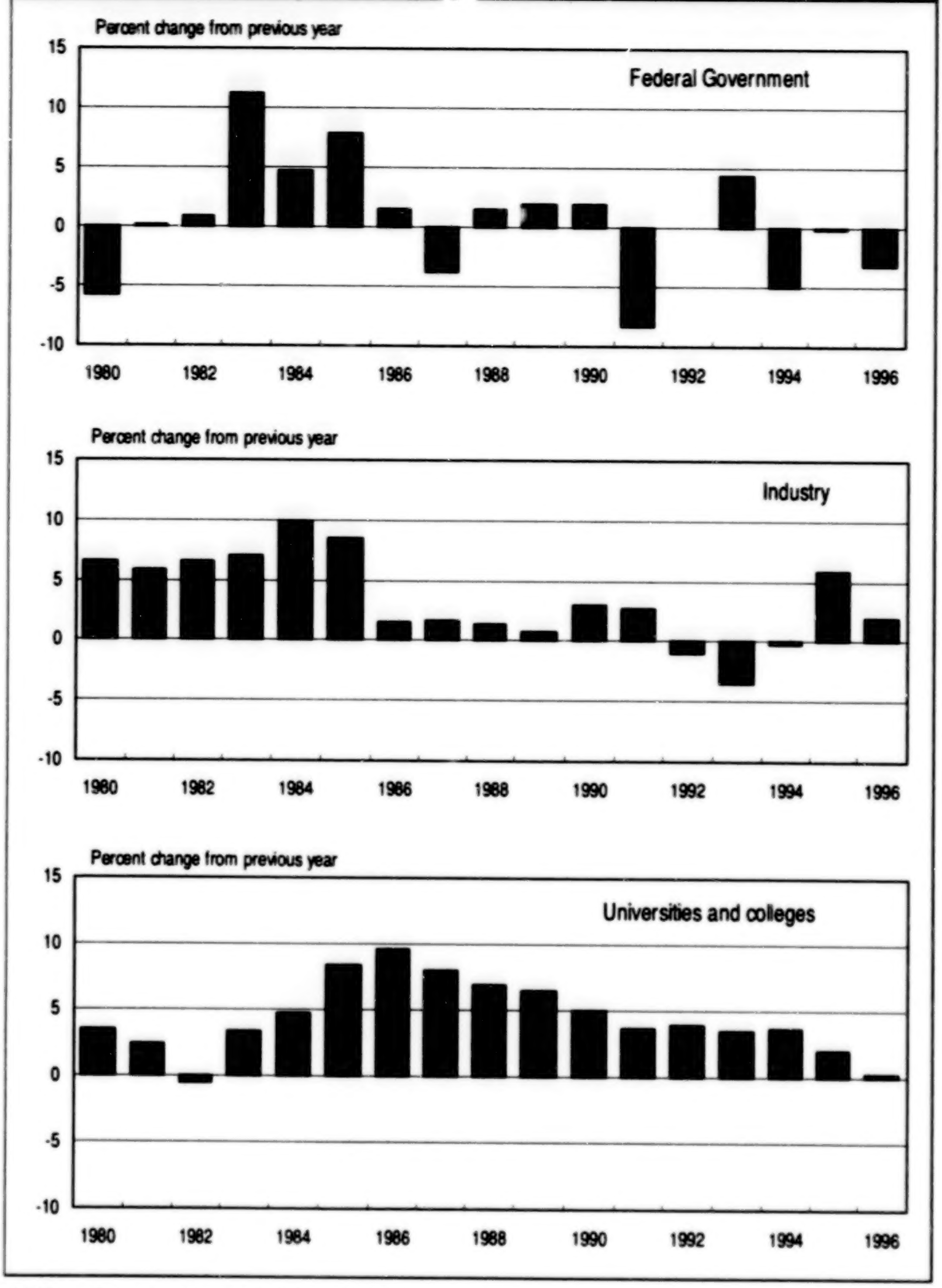
[2] FFRDCs administrered by individual universities and colleges and by university consortia.

KEY: FFRDC = Federally funded research and development center

NOTE: State and local government funds were included in industry funds reported to industry performers, and in university and college funds reported to university and college performers.

SOURCE: National Science Foundation/SRS

Chart 11 Changes in natio[illegible]D spending, by performer: 1980-96 (based o[illegible]stant 1987 dollars)



NOTE: Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; table C-4

Table 6. Total industrial R&D performance, by industry: 1984, 1988, 1992, and 1994

	Year			
	1984	1988	1992	1994
Total Industrial R&D Performance (millions of current dollars)	74,800	97,015	119,110	119,595
Distribution by Industry	[percent]			
Drugs and medicines (283)	4	5	7	8
Industrial and other chemicals (28, excluding 283)	6	6	6	6
Petroleum refining and extraction (13, 29)	3	2	2	2
Machinery and computers (35)	14	13	13	7
Electrical equipment (36)	18	15	11	13
Aircraft and missiles (372, 376)	25	25	14	12
Other transportation (37, excluding 372, 376)	10	11	9	12
Professional and sciencific instruments (38)	6	6	8	10
Other manufacturing industries	7	6	6	6
Nonmanufacturing industries	7	11	24	24

NOTES: Numbers in parentheses are SIC codes.
As a result of changes in the underlying survey design, data for 1992 and 1994 are not directly comparable with those for earlier years. See accompanying text and appendix A.

SOURCE: National Science Foundation/SRS, table C-26

A new sample had been selected in 1992 for the underlying industry R&D survey, the first since 1987. As a result, data for 1991 and subsequent years reflect more recent information about the distribution of R&D expenditures across industry groups, the R&D performance of smaller firms, and the R&D performance of firms classified in the nonmanufacturing sector. Shifts in non-federal R&D expenditures reported for 1994 in table 3 reflect the revised information obtained using this new sample. (See appendix A for a more complete discussion of the sample selection.)

Federal financing for specific industries varies considerably. The Federal Government provided $22.5 billion for all industry R&D performance in 1994, the most recent year for which detailed industry-specific data are available by all sources of funds. Aerospace companies, alone, received 39 percent of all Government funds provided to industry. Consequently, 62 percent of the aerospace industry's R&D dollars came from Federal sources, with the remaining 38 percent coming from companies' own funds (chart 12). In comparison, the electrical equipment industry financed 88 percent of its own R&D in 1994; the machinery industry funded 99 percent of its R&D in 1994; and chemical companies—including pharmaceutical firms—funded 98 percent of their R&D in 1992.[19]

FEDERAL GOVERNMENT

The Federal Government will perform $16.2 billion of the 1996 U.S. R&D total, based on preliminary estimates. This figure is slightly lower than the level estimated for 1995, $16.4 billion, which reflects a real decline of 3.3 percent. Federal agencies account for 8.8 percent of the projected 1996 national R&D performance effort; this continues a gradual decline of Federal funding as a percentage of total R&D, that began in the mid-1970s.

Until 1980, the Federal Government had been the second largest R&D performer in the Nation. Its share of the national R&D performance total, however, fell from 16 percent in 1970 to 12 percent in 1980. This reduction was due primarily to cutbacks in space R&D

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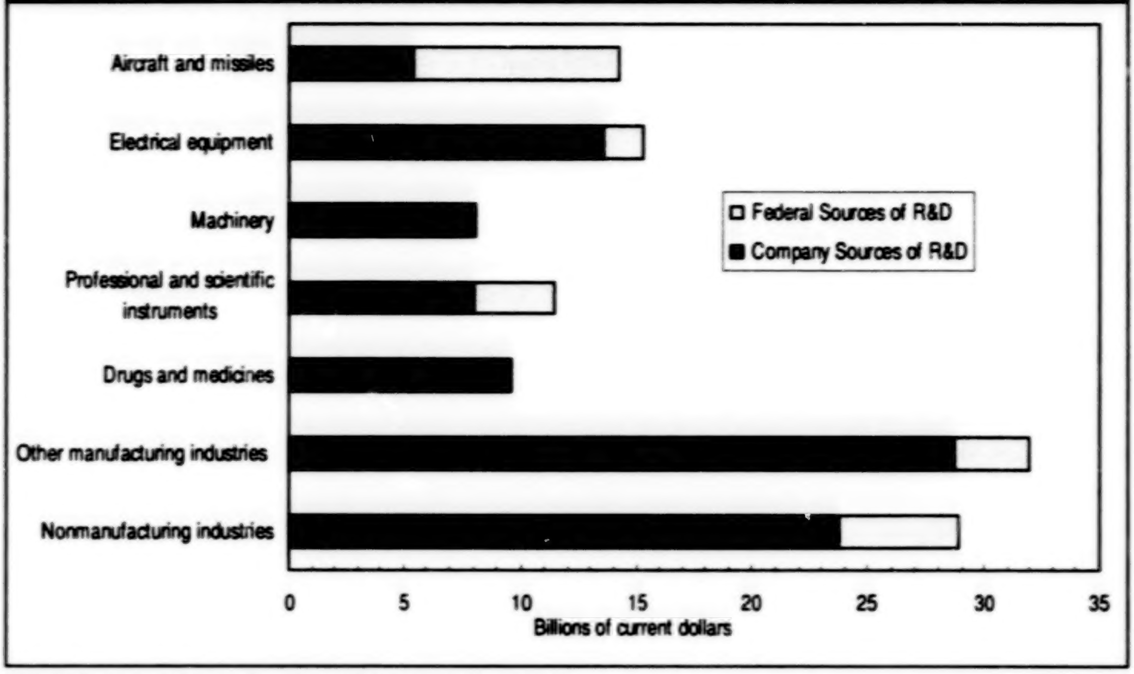
[19] The most recent year for which total R&D performance data were available for the industry chemicals and allied products (SIC code 28) was 1992. (See table C-29.)

Chart 12. Industrial R&D performance, by industry and source of funds: 1994



SOURCE: National Science Foundation/SRS; tables C-30 and C-31

programs. NASA funds for intramural R&D performance decreased by more than one-half in real terms during this period. As a result, in 1980, the academic sector—including associated FFRDCs—surpassed the Federal Government in terms of share of national R&D performance.

Preliminary estimates of Federal obligations for intramural research for 1996 are slightly higher than preliminary estimates of intramural performance—$16.29 billion versus $16.20 billion, respectively, in current dollars. Intramural R&D obligations by DOD will decrease in real terms between 1995 and 1996 by 11.8 percent to its projected 1996 level of $7.85 billion (in current dollars). NASA's intramural R&D obligations will decrease as well, by 7.25 percent in real terms, to $2.03 billion (in current dollars); while HHS—whose intramural R&D is mostly obligated to NIH—will rise by approximately 1.1 percent, to $2.35 billion.[20] Together, these three agencies account for 75.0 percent of Federal intramural R&D obligations for 1996 (table 3).

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[20] This increase represents the overall effect on intramural R&D obligations for the agency, which takes into account the Social Security Administration (SSA) becoming a separate agency from HHS during FY 1995. That is, the percentage increase reported would be larger—though negligibly—if HHS in 1995 were defined as not including SSA, as it is in 1996.

UNIVERSITIES AND COLLEGES

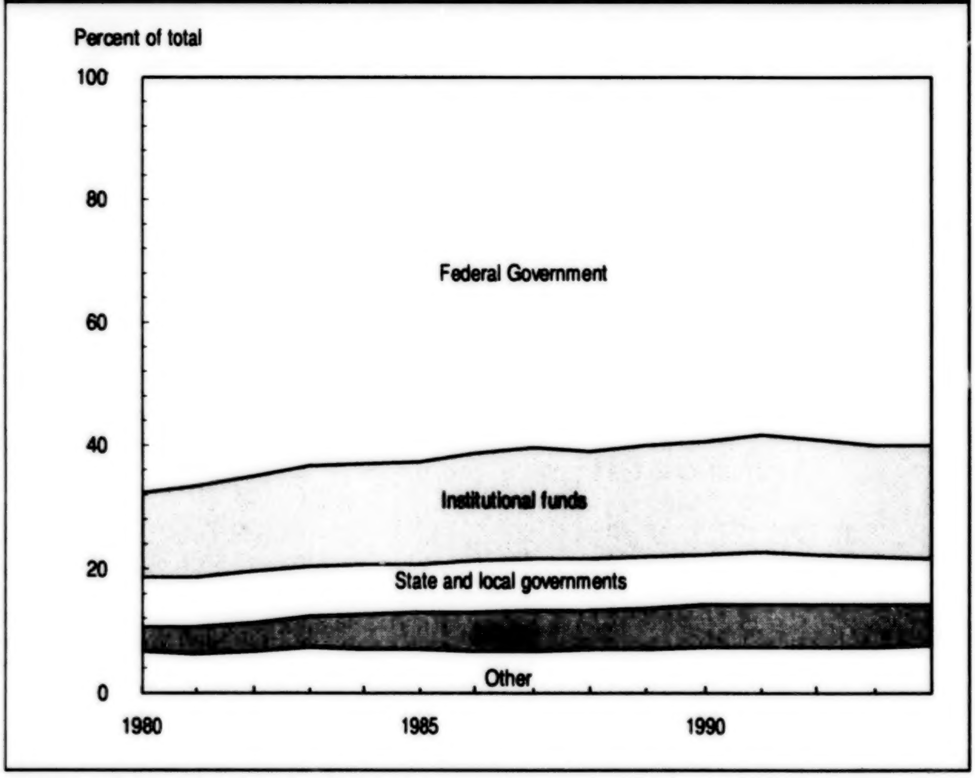
Universities and colleges (excluding academically administered FFRDCs) are expected to account for 12.2 percent ($22.4 billion) of the 1996 national R&D performance effort. This total implies that there has been virtually no change (less than 0.1 percent increase) between 1995 and 1996 in the amount of real R&D performance carried out at universities and colleges.

Unlike the industry and Federal sectors, overall R&D performance by the academic sector increased rapidly throughout the mid-1980s and continued to grow, though less rapidly, in the early 1990s (chart 11).[21] From 1980 to 1985, real growth averaged under 4 percent annually. While real increases in the R&D performance of other sectors slowed considerably after 1985, universities and colleges experienced a preliminary 4.8 percent real annual growth rate over the 1985-96 period.

The Federal Government provides the major share of the R&D funds used by universities and colleges. In the early 1980s, Federal funds accounted for two-thirds of the academic total. By 1991, however, this share had dropped to a low of 58 percent; and it has not changed noticeably since then—e.g., the share for 1996 is 60 percent, according to preliminary calculations. Consequently, much of the recent growth in academic R&D performance is attributable to increased funding from non-Federal sources (chart 13).

Between 1985 and 1996, total R&D performance by universities and colleges (excluding FFRDCs) increased by 66.6 percent in real terms, while the academic share of total U.S. R&D performance grew from 8.5 percent to 12.2 percent, by preliminary

Chart 13. Source of funds for university and college R&D performance: 1980-94



NOTES: State and local government funds exclude general purpose appropriations that universities use at their discretion for R&D. Such funds are included in the institutional funds total.

SOURCE: National Science Foundation/SRS; table C-2

calculations. Federally financed academic R&D, expected to reach $13.4 billion in current dollars in 1996, is up 59.2 percent in real terms from 1985; university and college R&D performance using non-Federal funds, $9.0 billion, is up by 79.0 percent in real terms. The links between academic institutions and industry expanded considerably. Industry's academic R&D funding is expected to increase by 105.9 percent in real terms from 1985 to 1996, although it accounts for just 7.1 percent ($1.6 billion) of academia's expected 1996 R&D total. Universities' own institutional funds—the largest non-Federal source—are, by preliminary calculations, 87.2 percent higher in real terms in 1996 than in 1985 and account for 18.8 percent ($4.2 billion) of their separately budgeted R&D expenditures. Real R&D funds from State and local governments are expected to increase by 53.3 percent over this 11-year period, and constitute 7.1 percent ($1.6 billion) of universities' projected 1996 R&D total.

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[21] R&D data are for separately budgeted expenditures only. Consequently, they exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from State and local governments and other non-Federal sources, including endowments.

ACADEMICALLY ADMINISTERED FFRDCs

R&D performance in 1996 by university-administered FFRDCs is estimated at $5.4 billion, or approximately 2.9 percent of the national R&D performance effort. These FFRDCs account for 19.4 percent of the total 1996 academic (universities and colleges plus academically administered FFRDCs) R&D performance.

The most recent year for data on university R&D expenditures by field of study is 1994 (table C-39). In this year, engineering accounted for 32.1 percent of R&D expenditures at university-administered FFRDCs; the physical sciences (astronomy, chemistry, physics, and related subfields) accounted for 41.5 percent. Within universities and colleges, engineering and the physical sciences represented 15.8 percent and 10.3 percent, respectively, of R&D performance in 1994. Life sciences accounted for 54.7 percent of R&D total at universities and colleges but a considerably smaller share (3.6 percent) of R&D at academically-administered FFRDCs (tables C-37 and C-39).

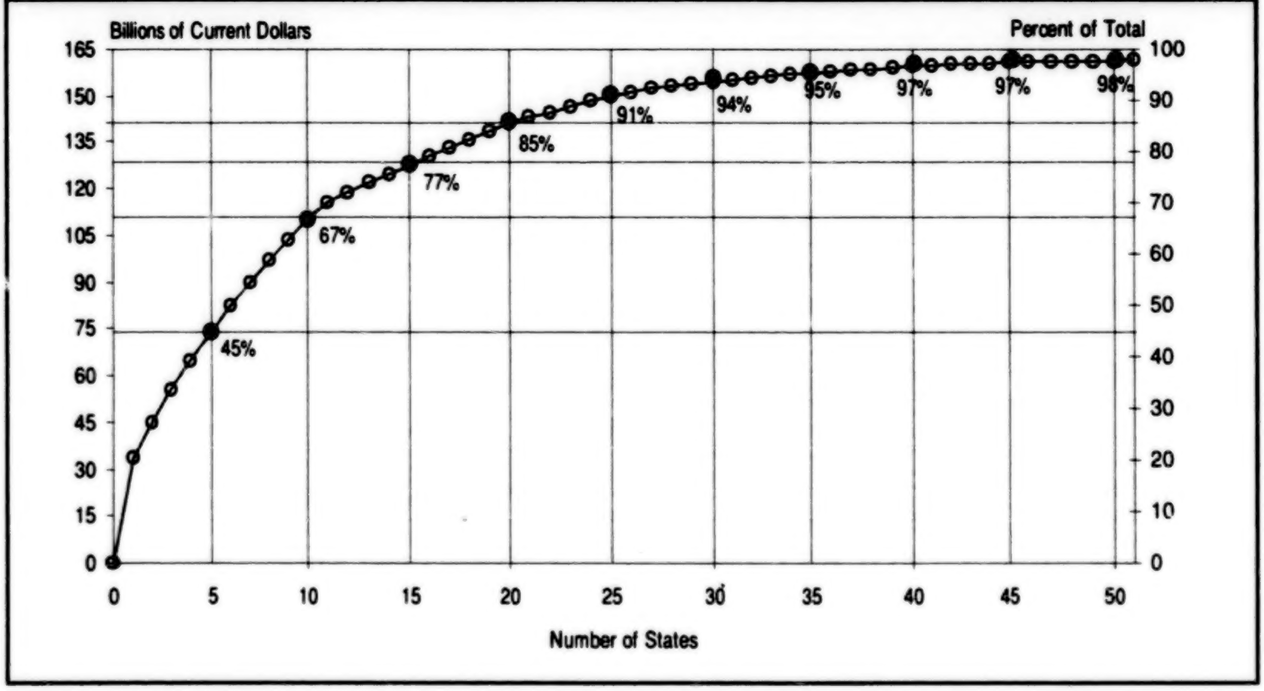
From 1974 to 1980, academically administered FFRDCs increased their R&D performance by 62.6 percent in real terms. This increase largely mirrored the Federal emphasis on energy programs. Since 1980, the Federal shift from energy to defense has resulted in much slower growth in academically administered FFRDC R&D performance—a 31.6 percent increase in real terms from 1980 to 1996 based on preliminary calculations, or about one-half the growth in more than twice the time.

NATIONAL R&D PERFORMANCE PATTERNS—BY STATE

The latest data available on the State distribution of R&D expenditures are for 1993.[22] These data cover R&D performance by industry, academia, and Federal agencies, and the federally funded R&D activities of nonprofit institutions.[23] The State data on R&D contains 52 records: the 50 States; the District of Columbia; and "other/unknown," which accounts for R&D in Puerto Rico and other non-State U.S. regions, as well as R&D for which the particular State in question was not known. Approximately two-thirds of the R&D that could not be associated with a particular state is R&D performed by the nonprofit sector. Consequently, the distribution of R&D by State indicates primarily where R&D is undertaken in Federal, industrial, and university facilities.

The State distribution of R&D performance is highly concentrated (chart 14). The top 25 areas for R&D performance—including the District of Columbia, but excluding "other/unknown," which would be ranked 12th if it were counted—accounted for approximately 91 percent ($150 billion in current dollars) of total U.S. R&D performance in 1993.

Chart 14. Cumulative distribution of U.S. R&D performance, by State: 1993



NOTES: The District of Columbia is included here as a State. The cumulative sum reaches 97.8%, rather than 100%, due to R&D performance in the other/unknown category (unassignable to a State).

SOURCE: National Science Foundation/SRS; table C-17

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[22] Although annual data are available on the location of R&D performance by the academic and Federal sectors, NSF conducts surveys on the State distribution of industrial R&D performance only in odd-numbered years. At this writing, the 1995 industry R&D survey data have not been processed, making 1993 the most recent year for which the State-specific R&D totals can be reported.

[23] R&D performance data include the R&D activities in FFRDCs in each sector of the economy. For a more detailed description of these data, as well as comparisons of 1985 R&D expenditures with other economic measures (for example, population and gross state product), see NSF, *Geographic Patterns: R&D in the United States*, NSF 89-317 (Washington, DC, 1989).

Of the total U.S. R&D dollars, approximately one-half (49.9 percent) was spent in six States: California, New York, Michigan, Massachusetts, New Jersey, and Pennsylvania. Such concentration reflects two factors: the size of State economies as measured by GSP, and the intensity of their R&D as a proportion of GSP. For example, New York is ranked second in both R&D performance and in GSP, while it is 19th among all States in intensity of R&D (table C-17). Consequently, New York's high level of R&D can be attributed primarily to its economic size. In contrast, Massachusetts is ranked 11th in GSP, but fourth in total R&D because of a high R&D intensity. New Mexico has the highest R&D intensity, 8.1 percent, which is attributable to the presence of several FFRDCs in the State; however, because of its relatively small economy, the State is ranked 17th in total R&D performance.

Approximately 67 percent of the national R&D effort was performed in 10 States—the preceding list of six together with Maryland, Texas, Illinois, and Ohio. California, the largest R&D performer, accounted for $33.7 billion (in current dollars) in 1993. In each of the other leading States, R&D expenditures ranged between $6 and $11 billion (in current dollars).

The 10 States that ranked highest in 1993 R&D performance were the same States in the top 10 in 1975, although their ranking has shifted somewhat. The highest three (California, New York, and Michigan) have retained their top ranks since 1975. Pennsylvania, fourth in 1975, was sixth in 1993. Texas moved from 10th place to 8th.

As expected, most of the States that are national leaders in total R&D performance are also leading R&D performers in one or more economic sectors (table 7). For example, of the 10 States that led in total 1993 R&D performance:

- Nine also ranked among the top 10 industrial performers, with Maryland absent from the top 10 industrial performers and Washington added.
- Nine also ranked among the top 10 academic performers, which, absent New Jersey, included North Carolina.
- Six also ranked among the top 10 Federal performers—California, Massachusetts, New Jersey, Maryland, Texas, and Ohio; the other four were Virginia, Alabama, Florida and the District of Columbia.

The inclusion of Virginia and the District of Columbia reflects the concentration of Federal facilities and administrative offices within the Washington, D.C., metropolitan area. Major defense- and space-related research activity explains the inclusion of Alabama and Florida in the list of top 10 Federal performers.

Table 7 States leading in R&D performance by sector and R&D as a percentage of gross state product 1993

		Top 10 States in size of R&D performance, by type of performer				R&D intensity in relation to size of State economy		
Rank	Total R&D (millions of current dollars)	All R&D Performers in the State[1]	Industry	Universities & Colleges[2]	Federal Government[3]	Most R&D Intensive	R&D/GSP (percent)	Gross State Product (billions of current dollars)
1	33,721	California	California	California	Maryland	New Mexico	8.1	$33.8
2	10,974	New York	Michigan	New York	California	Maryland	6.2	120.0
3	10,778	Michigan	New York	Texas	D.C.	D.C.	6.1	41.6
4	9,486	Massachusetts	New Jersey	Maryland	Virginia	Massachusetts	5.7	167.1
5	9,181	New Jersey	Massachusetts	Massachusetts	Alabama	Michigan	5.1	213.4
6	8,278	Pennsylvania	Pennsylvania	Pennsylvania	Florida	Delaware	4.9	25.6
7	7,423	Maryland	Illinois	Illinois	Ohio	California	4.3	786.4
8	6,966	Texas	Ohio	Michigan	New Jersey	Washington	4.2	129.6
9	6,778	Ilinios	Texas	North Carolina	New Mexico	New Jersey	4.0	229.1
10	6,398	Ohio	Washington	Ohio	Texas	Colorado	3.2	88.6

[1] Includes in-state R&D performance of industry, universities, associated federally funded research and development centers (FFRDCs), and Federal agencies and the federally funded R&D performance of nonprofit institutions.

[2] Excludes R&D activities of university-administered FFRDCs located within these states.

[3] Excludes R&D activities of all FFRDCs located within these states.

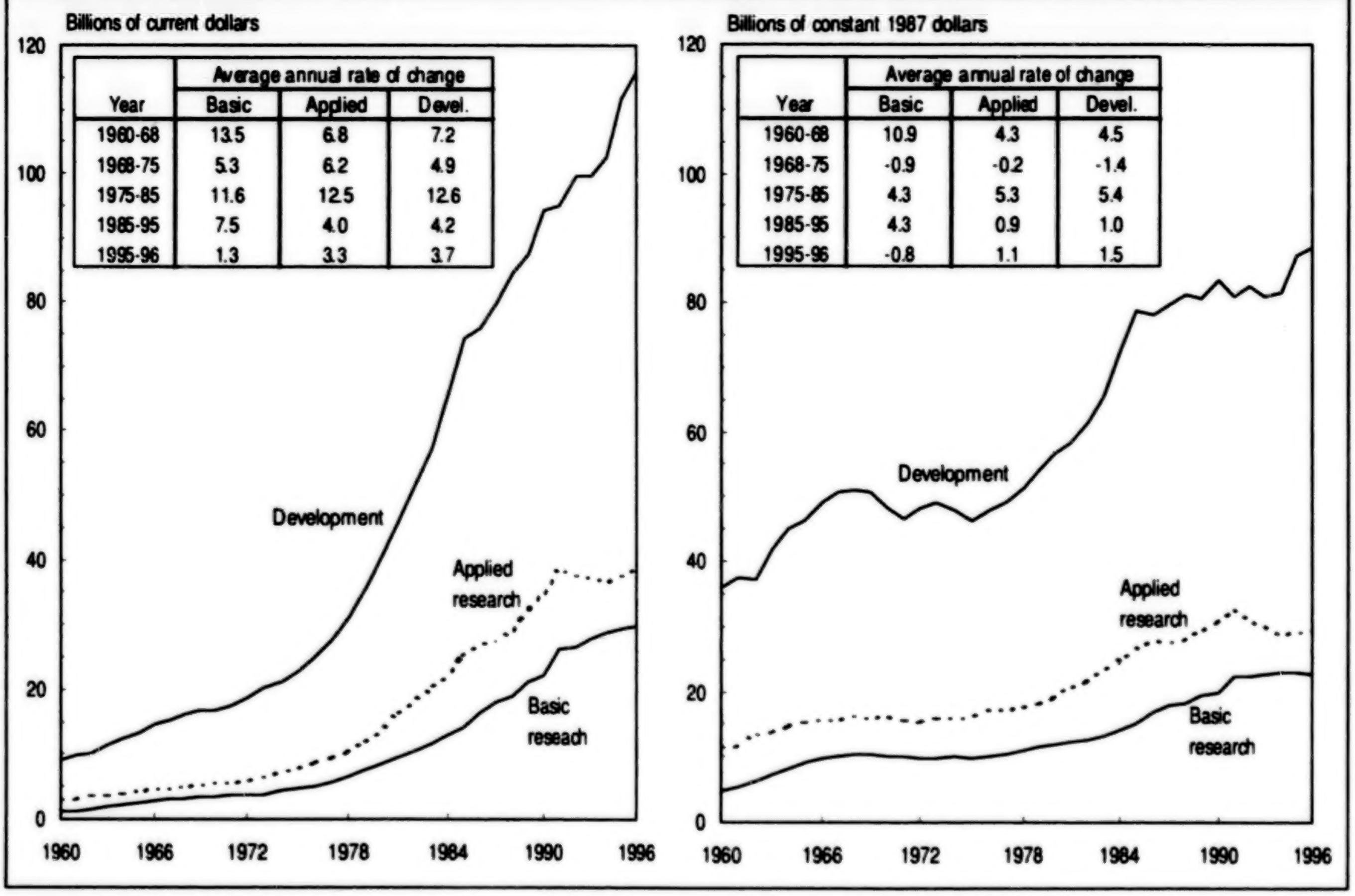
SOURCES: National Science Foundation/SRS, table C-17, and Bureau of Economic Analysis

CHARACTER OF WORK

The Nation will spend an estimated $29.8 billion on basic research in 1996, $38.8 billion on applied research, and $115.8 billion on development (chart 15). These totals represent small changes from preliminary estimates of 1995 levels: a 0.9 percent decrease, in real terms, for basic research; a 1.0 percent increase for applied research; and a 1.5 percent increase for development. As a share of all 1996 projected R&D performance expenditures, basic research represents 16 percent, applied research 21 percent, and development 63 percent.

The expected 1996 percentage shares differ from those reported in earlier periods. For example, in 1980 basic research accounted for 13 percent, applied research for 22 percent, and development for 65 percent. The methodology for imputing character-of-work estimates for industry's R&D performance, however, was changed for 1986 and later years. Consequently, data after 1985 are not strictly comparable with data for 1985 and earlier years. The revised approach resulted in relatively higher estimates for basic and applied research and lower estimates for development expenditures. Furthermore, the improved sampling of industry's R&D activity beginning in 1992 also resulted in notably higher basic research estimates than had previously been presented. (See appendix A for further details.)

Chart 15. National R&D spending, by character of work: 1960-96



Year	Average annual rate of change		
	Basic	Applied	Devel.
1960-68	13.5	6.8	7.2
1968-75	5.3	6.2	4.9
1975-85	11.6	12.5	12.6
1985-95	7.5	4.0	4.2
1995-96	1.3	3.3	3.7

Year	Average annual rate of change		
	Basic	Applied	Devel.
1960-68	10.9	4.3	4.5
1968-75	-0.9	-0.2	-1.4
1975-85	4.3	5.3	5.4
1985-95	4.3	0.9	1.0
1995-96	-0.8	1.1	1.5

NOTES: Imputation methodology was changed for industry after 1985, See appendix A. Data are preliminary for 1995 and 1996.

SOURCE: National Science Foundation/SRS; tables C-6, C-9, and C-12

BASIC RESEARCH

By preliminary calculations, the average annual real growth in basic research performance between 1986 and 1996 was 2.9 percent, in contrast with 4.8 percent real annual growth between 1980 and 1985.

In terms of support, the Federal Government provided the majority of funds used for basic research. However, the Federal share of funding for basic research dropped as a proportion of all funding—from 70 percent in 1980 to a preliminary 58 percent ($17.2 billion in current dollars) in 1996. This decline does not reflect a diminution in Federal funding for basic research (in fact, it rose an estimated 57 percent in real terms between 1980 and 1996), but instead reflects the growing tendency for such funding to come from other sectors (up 173 percent over the 16-year period).

With regard to performance, universities and colleges account for the largest share (51 percent) of the projected basic research total for 1996. When the performance of university-administered FFRDCs is included, the academic sector's share of total climbs to 61 percent. In 1996, basic research performance of universities—excluding FFRDCs—will reach an estimated $15.1 billion in current dollars, representing a 0.8 percent increase from 1995 in real terms. The Federal Government is expected to provide a preliminary 63 percent of the basic research funds used by the academic sector in 1996. Non-Federal sources, including industry and State governments, will provide the remaining 37 percent.

APPLIED RESEARCH

Over the 1986-96 period, national applied research spending grew at an estimated average annual rate of 0.6 percent in real terms. Increases in industrial support are responsible for most of this gain.

Federal support in 1996 accounts for 36.4 percent ($14.1 billion in current dollars) of the Nation's support for applied research. During the 1980s, Federal support for applied research was intentionally deemphasized in favor of support for basic research. Even with the current administration's push to increase its support of generic/precompetitive applied research, preliminary estimates of Federal support in 1996 for applied research are only 82 percent of that for basic research ($14.1 billion in current dollars versus $17.2 billion, respectively).

Performance by industry accounts for 65 percent ($25.3 billion in current dollars) of the 1996 preliminary total for applied research. Non-Federal sources will account for most ($21.0 billion) of these funds; Federal sources will provide the rest ($4.3 billion).

For the Nation's nonindustrial applied research in 1996, preliminary data indicate that most will be performed by universities and colleges ($5.7 billion in current dollars) and by the Federal Government ($4.9 billion). Approximately 24 percent of the projected Federal intramural applied research will be performed by DOD, another 20 percent by HHS, and 8 percent by NASA.[24] Total Federal applied research performance has been remarkably level over the past 30 years, experiencing only 0.3 percent average annual growth in real terms since 1966.

DEVELOPMENT

The Nation's annual funding for development has changed little since the mid-1980s. From 1980 to 1985, development grew, on average, by 6.8 percent per year in real terms as increasingly larger shares of the national R&D effort were directed toward defense R&D, which tends to be approximately 90 percent development. Between 1986 and 1996, development performance in real terms grew at an average annual rate of 1.2 percent, climbing from, in constant 1987 dollars, $78.3 billion in 1986 to $83.4 billion in 1990; it fell to $80.9 billion in 1991 and 1993 before rising, by preliminary calculations, to $88.4 billion in 1996. Growth in both industry's and the Federal Govern-ment's development funding slowed considerably, the latter reflecting the fiscal constraints placed on overall defense spending. Of the expected 1996 national funding of development, industry will provide 73 percent and the Federal Government, 26 percent.

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[24] These percentages were derived from preliminary Federal obligations as reported in NSF, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996*, NSF 97-302.

In terms of performance, industry will account for 88 percent ($102 billion in current dollars) of the Nation's 1996 development activities. Federal performance will account for 8 percent ($8.8 billion in current dollars).

R&D SCIENTISTS AND ENGINEERS

NSF sponsors a variety of surveys designed to collect data on the human resources devoted to science and technology in the United States, including information on worker inputs for R&D. Surveys directed at *employers or institutions* focus on the amount of time devoted to the performance and management of R&D. These data are reported in terms of person-years, or full-time-equivalent R&D jobs. Surveys directed at *individuals* collect data on self-reported primary work activity; that is, the activity on which a scientist/engineer spends the largest proportion of time but that is not necessarily full time. The 1994 *National Patterns* was the first to include revised estimates of the total number of scientists and engineers engaged primarily in R&D activities. The national totals include an FTE count of S&Es employed by industry, the total number of Federal employees whose primary work activity is research or development, an FTE estimate of graduate students' research activity, and the number of doctorate-holding S&Es working in educational or nonprofit organizations who self-report their primary work activity as research, development, or (up to 1993) the management of R&D work. These concepts are further described in appendix A.

NATIONAL ESTIMATES OF R&D SCIENTISTS AND ENGINEERS

Approximately 962,700 scientists and engineers were employed in 1993 on R&D activities in the United States (table C-18). This figure reflects virtually no change (a 0.2 percent increase) from the 1991 level of 960,400. It reflects only a 20.1 percent increase over the 1985 figure of 801,900, the first year for which revised national tabulations are derived.[25] In 1993, industry employed 79.4 percent of these R&D personnel. Companies classified under nonmanufac-turing industries accounted for the single largest industry share—25.3 percent of the industry total of 764,500 S&Es. This stands in sharp contrast to only 6 years earlier, 1987, when the transportation equipment industry was the largest employer of industry R&D scientists and engineers, and had nearly twice as many R&D S&Es as nonmanufacturing (187,800 versus 99,200, respectively). The Federal Government employed 6.2 percent (60,000) of the Nation's R&D S&Es in 1993, while the academic and nonprofit sectors accounted for the rest. Although the sector-specific survey methodologies differ considerably, the data indicate that a much higher percentage of Federal R&D S&Es in 1993 were employed in development activities (58.2 percent) than the percentage of academic R&D S&Es holding doctorates (3.2 percent).

In 1981, the number of scientists and engineers engaged in R&D per 10,000 labor force was just under 62 (table C-20). This ratio climbed continually through the 1980s, reached a peak of 75.7 per 10,000 in 1991, and dropped slightly to the most recent reported level of 74.3 per 10,000 in 1993.

In 1993, the Nation spent an average of approximately $139,000 (constant 1987 dollars) on R&D per R&D scientist and engineer; this includes salaries, fringe benefits, materials, supplies, and overhead for R&D activities. The comparable figure for 1985 was about $150,000 (constant 1987 dollars). (See table C-36 for industry-specific ratios.)

SURVEYS OF DOCTORAL SCIENTISTS AND ENGINEERS

In 1993, the latest year for available data, there were approximately 462,870 doctoral scientists and engineers employed in the United States (table C-19). This total represents a 34.6 percent increase over the 344,000 reported for 1981. Holders of doctorates in sciences greatly outnumbered holders of doctorates in engineering—388,000 versus 75,000—with the number for sciences including 137,000 under "social and related sciences."

Forty-one percent of all science and engineering doctorate-holders reported R&D as their primary work activity in 1993. Basic research as a primary activity accounted for 14 percent of all scientists and engineers holding doctorates; applied research accounted for 20 percent; development, 5 percent; and design 2.3 percent.[26] Teaching as a primary activity accounted for 22 percent of doctoral scientists and engineers; the remaining 37 percent were distributed among management/sales/administration (18 percent), computer applications (4 percent), and other professional services (15 percent).

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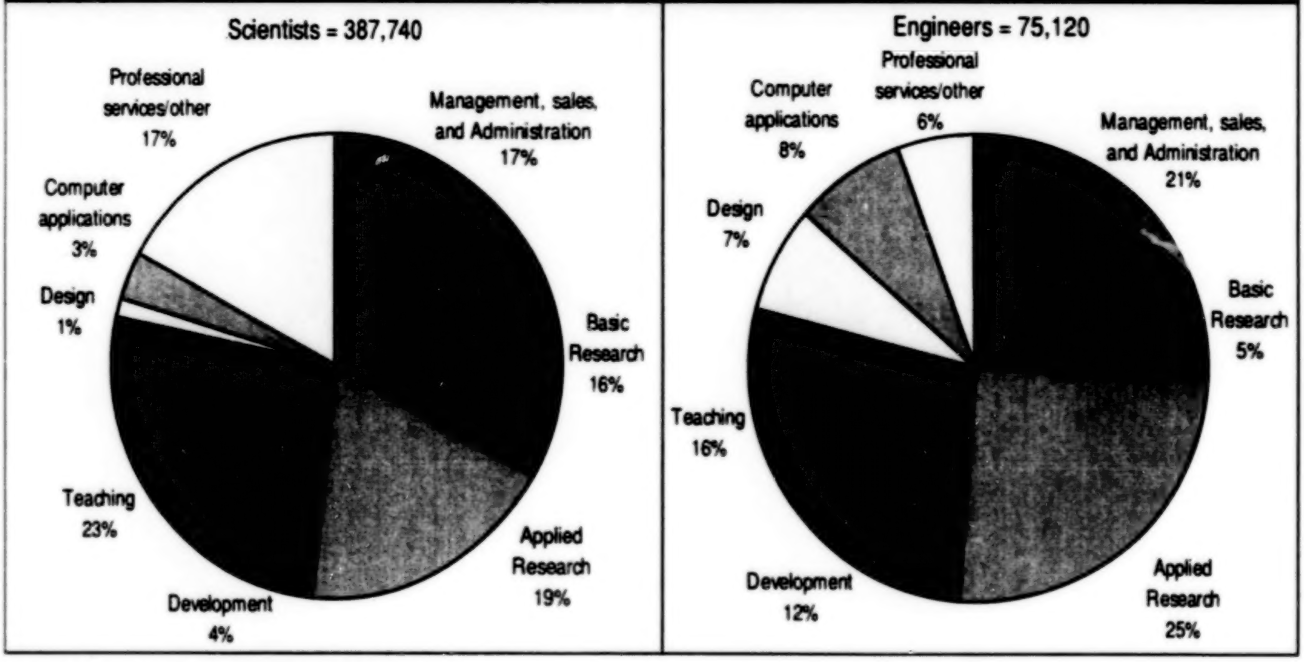
[25] See appendix A for details on the FTE R&D scientists and engineers series.

Scientists holding doctorates in 1993 were more likely to have basic research as their primary activity (16 percent) than engineers holding doctorates (5 percent). Consequently, scientists holding doctorates were less likely than engineers to have applied research, development, or design as their primary activity. The respective proportions for doctoral scientists and engineers with regard to these primary activities were 19 percent versus 25 percent for applied research; 4 percent versus 12 percent for development; and 1.3 percent versus 7 percent for design.

Doctoral engineers reported more involvement in management, sales, and administration as a primary work activity (21 percent) than doctoral scientists (17 percent). In contrast, scientists reported more involvement in teaching than engineers—23 percent versus 16 percent (chart 16).

Chart 16. Employed doctoral scientists and engineers, by primary work activity: 1993



SOURCE: National Science Foundation/SRS; table C-19

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[26] The category of R&D called "design" here refers to an engineering activity—e.g., the design of equipment, processes, structures, and prototype models—rather than a managerial activity—e.g., the design of a research program.

APPENDIX A:
TECHNICAL NOTES

DEFINITIONS FOR CLASSIFICATION AND MEASUREMENT

CLASSIFICATION OF SECTORS

The National Science Foundation (NSF) follows a four-sector division in reporting research and development (R&D) funds and personnel and maintaining time-series data on expenditures and employment. The sectors are (1) industry, (2) the Federal Government, (3) universities and colleges, and (4) other nonprofit organizations. These are described in more detail below. Data also are collected for federally funded research and development centers (FFRDCs), which are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and associated training purposes. Each center is administered either by an industrial firm, an individual university, a university consortium, or a nonprofit institution.

Federal Government. This sector consists of the agencies of the Federal Government of the United States.

Industry. This sector consists of both manufacturing and nonmanufacturing companies. Manufacturing companies are reported by major industry groupings. Nonmanufacturing companies include those in mining, construction, transportation, communications, and selected service industries, such as R&D laboratories and computer and data processing services. Performance of FFRDCs administered by industrial firms generally is included in industry totals, although FFRDC breakouts are available and reported separately from R&D totals. Industry's funding of industry R&D includes all funds received from non-Federal sources (e.g., from State and local governments).

Universities and Colleges. This sector consists of all institutions of higher education, both public and private. Performance of FFRDCs administered by universities and colleges are reported separately from totals for this sector. University funding of university R&D includes (1) State and local government funds separately budgeted for R&D and (2) restricted or general funds that the institutions themselves have been free to allocate for research. Funds from the Federal Government, industry, or other nonprofit institutions that are supplied in the form of grants or contracts for R&D at a university, are credited to the appropriate source. For example, research contracts from industry are treated as university performance funded by industry. Funds given to the institution by industry for general educational purposes and used by the school—at its discretion—for research are treated as university performance financed with the university's own funds.

Other Nonprofit Institutions. This sector consists of institutions that fall into two general groups: (1) organizations that are primarily granting in nature—i.e., private philanthropic foundations and voluntary health agencies; and (2) public and private organizations involved in performing R&D, including FFRDCs administered by nonprofit organizations.

RESEARCH AND DEVELOPMENT CATEGORIES

Research and Development. In this report R&D consists of basic and applied research in the sciences (including medical sciences) and in engineering, and activities in development, all defined below.

The Federal, university, and nonprofit sectors include data for the broad fields of physical sciences, environmental sciences, mathematical sciences, computer sciences, life sciences, psychology, social sciences, an all-inclusive "other sciences" category, and engineering. Industry coverage is limited to (1) the physical sciences, including related engineering and (2) the biological sciences, including medicine but excluding psychology. Industry R&D specifically excludes research in the social sciences.

Basic Research. Within the Federal, university, and nonprofit sectors, basic research is defined as research directed toward increases in knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific application toward processes or products in mind. For the industry sector, basic research projects are defined as "original investigations for the advancement of scientific knowledge . . . which do not have specific commercial objectives, although they may be in fields of present or potential interest to the reporting company."

Applied Research. Within the Federal, university, and nonprofit sectors, applied research is defined as research directed toward gaining "... knowledge or understanding necessary for determining the means by which a recognized and specific need may be met." The applied research definition for the industry sector is modified to include "... research projects which represent investigations directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes."

Development. The NSF survey definition of development is "... the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes." It excludes quality control, routine product testing, and production.

DEFENSE-SPACE-CIVILIAN CLASSIFICATION

This report contains data on (1) the preliminary percentage distribution of total U.S. R&D performance by national objective (table C-14) and (2) the reported distribution of Federal R&D authority by budget function (table C-23). The performer-based U.S. shares differ from the Federal budget authority shares for several reasons. The U.S. shares are based on expenditures reported by performers that often expend Federal R&D funds in a year other than the one in which the Federal Government provided authorization, obligations, or outlays. In addition, the two series are based on slightly different concepts. For example, whereas in the U.S. series all of the National Aeronautics and Space Administration's (NASA's) R&D funds are considered to be expenditures for space R&D, the budget authority data are distributed according to the functional categories that constitute the Federal budget. Thus, NASA's R&D budget authorizations are distributed between the space research and technology function and the transportation function.

"Defense R&D" consists of R&D spending by the Department of Defense (DOD) and defense-related atomic energy programs of the Department of Energy. All DOD activities are classified as defense, although some activities have secondary objectives (for example, space). "Space R&D" consists of R&D spending by NASA. All industry-funded R&D is classified as *civilian R&D*, including expenditures by aerospace and electronic industries.

CURRENT OPERATING COSTS

Funds used for R&D refer to current operating costs. These costs consist of both direct and indirect costs. They include not only salaries, but also fringe benefits, materials, supplies, and overhead. The R&D costs include depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition in the surveys of the industry and academic sectors. Under the accounting practices of some Federal agencies, obligations for capital items may be included.

For universities and colleges, R&D data are for separately budgeted expenditures only. Consequently, these data exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from State and local governments and other non-Federal sources, including endowments.

INTRAMURAL FEDERAL PERFORMANCE OF R&D

Intramural R&D performance by Federal agencies refers to work carried on directly by agency personnel. Federal obligations reported under this category are for activities performed or to be performed by the reporting agency itself or represent funds that the agency transfers to another Federal agency for performance of work, *as long as the ultimate performer is that agency or any other Federal agency*. If the ultimate performer is not a Federal agency, the funds so transferred are instructed to be reported by the transferring agency under the appropriate extramural performer category (universities and colleges, other nonprofit institutions, or industrial firms).

Intramural activities cover not only the actual intramural R&D performance, but also the costs associated with the planning and administration of both intramural and extramural programs by Federal personnel. Intramural activities also include the costs of supplies and equipment, essentially of an "off-the-shelf" nature, that are procured for use in intramural R&D. For example, the purchase from an extramural source of an operational launch vehicle (i.e., one that has gone beyond the development or prototype stage) that is used for intramural performance of R&D is reported as a part of the cost of intramural R&D.

CONTROLLING FOR INFLATION AND FOREIGN CURRENCY

Throughout this report, the term "current dollars" refers to dollar amounts as they are measured and exchanged in the actual year(s) in question. In contrast, "constant dollars" refers to dollar amounts normalized for inflation. For example, if the same dollar amount is reported in current dollars for two different years, this means that, because of inflation, fewer actual goods and services could be purchased with that amount in the more recent year than in the earlier year. If the same amount is reported in constant dollars for two different years, this means that, because the amount has been normalized for inflation, the same purchasing power would exist in each of the two years. Terms that are equal in meaning to current and constant dollars are, respectively, "nominal" and "real" dollars. These terms are also used to describe changes in dollar amounts over time. For instance, suppose a particular type of expenditure grew at a rate of 5 percent per year over a 10-year period. Such growth may be described as a 5 percent growth in real terms, or equivalently, a real growth of 5 percent, meaning the constant-dollar amounts grew at a 5 percent rate, while the current dollar amounts grew at a greater rate due to inflation.

In keeping with U.S. Government and international standards, R&D trend data usually are deflated to constant 1987 dollars using the gross domestic product (GDP) implicit price deflator. (See table C-1.) Since GDP deflators are calculated on an economy-wide rather than R&D-specific basis, their use more accurately reflects an "opportunity cost" criterion, rather than a measure of cost changes in doing research. That is, the GDP deflator, when applied to R&D expenditure or funding data, reflects the value of R&D in terms of the amount of other goods and services that could have been purchased with the same amount of money. The constant-dollar figures reported here thus should be interpreted as real resources foregone in engaging in R&D rather than in other activities such as consumption or physical investment.

Broad-based deflators—such as the GDP deflator—could also be useful in approximating changes in the costs of conducting R&D activities.[27] However, these deflators are less appropriate for calculating real R&D costs at a disaggregated level, e.g., in estimating the costs over time of conducting the level of R&D within a particular science or engineering subfield. In addition, even when an opportunity cost criterion is used, the usefulness of the deflator is constrained by the length of the time span examined—the longer the time span, the less meaningful the deflator. That is, over long spans of time, such as 20 years, dramatic changes in the makeup of goods and services create ambiguities in the interpretation and measurement of quality change, which in turn adversely affect the reliability of price deflators.

Comparisons in this report of U.S. and international R&D expenditure data are based on reported R&D investments converted to U.S. dollars using purchasing power parity (PPP) exchange rates. PPP exchange rates are designed to reflect differences in the purchasing power of currencies, based on the quantity of currency needed in order to purchase equivalent quantities of actual goods and services in the countries in question. That is, PPP exchange rates reflect real purchasing power, in the same sense that real dollars, described above, control for inflation. The PPP exchange rates used are generally not equivalent to market exchange rates, i.e., how much one currency would cost if it were to be bought (with another currency) from a financial institution. Market exchange rates are often influenced by factors other than real purchasing power, namely the relative supply of, and demand for, different currencies in international financial markets. A PPP exchange rate would not be equivalent to an ideal R&D exchange rate, which does not exist at present, but would, in theory, account for international differences in R&D costs alone. Nevertheless, the PPP exchange rate is generally better at reflecting differences in R&D costs between countries than a market exchange rate.

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[27] See J.E. Jankowski, "Do We Need a Price Index for Industrial R&D?," *Research Policy* 22, 1993: 195-205.

PERFORMER REPORTING

There is no single survey of R&D activity in the United States. Rather, NSF sponsors a series of surveys to collect data on the financial and human resources devoted to R&D in the various sectors of the U.S. economy (defined above). Although these surveys are not designed specifically for this purpose, they provide the primary source material for estimating the national R&D totals. Respondents indicate the amounts they spend on R&D in their own sector and, generally, the sources of these funds. To the greatest extent possible, national totals are based on data as reported by performers because they are in the best position to (1) indicate how much they spend in the actual conduct of R&D in a given year; (2) classify their work as basic research, applied research, or development; and (3) identify the sector of the economy in which their financing originated. For these reasons, and because the consistent use of performer reporting reduces the possibility of double-counting and conforms to international standards (as outlined by the Organisation for Economic Co-operation and Development), R&D data are presented on a performer basis whenever possible.

Separate R&D performance totals are reported for (1) the Federal Government, (2) industry, (3) universities and colleges, (4) university-administered FFRDCs, and (5) other nonprofit organizations. R&D performed by State and local government agencies is not included in the national R&D totals. When State and local governments are listed by a survey respondent as the source of non-Federal R&D funds, those amounts are included in the source totals of the sector reporting the R&D performance.

The following material outlines the approaches and assumptions used for deriving the national totals. The procedures for estimating R&D expenditures by performer and source for the years 1992 through 1996 are further summarized in table B-7. The structure of the table is the same as that of tables C-2, C-5, C-8, and C-11, in which the expenditure totals are detailed.

FEDERAL GOVERNMENT

Federal Performance Expenditures. Federal agency R&D obligations for intramural performance are treated as the equivalent of R&D expenditures in the *National Patterns* series. As detailed in the *Federal Funds for Research and Development* series *(Federal Funds)*, such intramural activities cover costs associated with the planning and administration by Federal personnel of intramural and extramural R&D programs as well as actual intramural R&D performance. In general, the universe of Federal agencies with R&D programs has been surveyed annually since 1953 for their R&D performance and since 1963 for the distribution by character of work. The most recent survey included R&D funding as reported by more than 300 reporting sites aggregated into 102 individual respondents from 32 Federal agencies or their subdivisions.

Federal Agencies as a Source of R&D Funding. NSF collects data on federally financed R&D from both Federal funding agencies and performers of the work (Federal labs, industry, universities, and other nonprofit organizations). As reported by Federal agencies, *National Patterns* uses data on Federal R&D budget authority and outlays, in addition to Federal obligations. The use of each series is clearly noted in the text.

- *Budget authority* is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the President.[28]
- *Obligations* represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated or when future payment of money is required.
- *Outlays* represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

For the reasons cited above, national R&D expenditure totals are constructed primarily based on data reported by performers and include estimates of Federal R&D funding to these sectors. But until performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected from the Federal agency funders of R&D are used to project R&D performance. When survey data from the performers subsequently are tabulated, these statistics replace the projections based on funder expectations. Historically, the two survey systems tracked fairly closely. For example, in 1980 performers reported using $29.5 billion in Federal R&D funding, and Federal agencies' reported total R&D funding between $29.2 billion in outlays and $29.8 billion in obligations (table B-1). In recent years, however, the two series have diverged considerably: For 1994, performers reported $60.2 billion in Federal R&D support, compared with the $66.2 billion to $68.3 billion reported by Federal agencies.

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[28] See NSF, *Federal R&D Funding by Budget Function: Fiscal Years 1994-96 (Budget Function)*, NSF 95-342 (Arlington, VA, 1995).

The difference in the Federal R&D data totals appears to be concentrated in funding of industry (primarily aircraft and missile firms) by the Department of Defense. Overall, industrial firms have reported significant declines in Federal R&D support since 1990, while Federal agencies reported level or slightly increased funding of industrial R&D. For 1994, Federal agencies reported $31.7 billion in total R&D obligations provided to industrial performers, compared with an estimated $22.5 billion in Federal R&D funding reported by industrial performers (table B-2). NSF is examining the causal factors for these divergent trends.

INDUSTRY

Sample Design Prior to 1992. In general, the industry sector has been surveyed annually since 1953 for its total R&D performance and since 1956 for the distribution by character of work. The U.S. Bureau of the Census conducts the survey for NSF. The survey's target population is companies, whether U.S. or foreign owned, that perform R&D in the United States. Prior to the 1992 survey, a new sample was drawn and canvassed only every 5 or 6 years (for example, in 1976, 1981, and 1987). In the intervening years, a subset of the last sample—called a panel and including all companies reporting more than $1 million in R&D—was surveyed. As a result, for the 1987 survey, approximately 14,000 firms were selected for the sample. For the 1988-91 studies, approximately 1,600 of these firms were annually resurveyed; the other firms did not receive another questionnaire, and their R&D data were estimated though not observed. Accordingly, data for the years in which a sample was not drawn did not include companies that were new entrants in the R&D field, and such data were generally biased in a downward direction. The Census Bureau, however, did estimate the annual changes in R&D data for companies that reported R&D in the sample year but were not included in the panel. As new samples were drawn, revisions to previous years' estimates were issued—a process called "wedging."

For example, a new sample was drawn for 1987, from which R&D data were collected for 1986 as well as 1987. The Census Bureau used the data from the new sample to revise 1986 R&D performance estimates. It also used the new 1986 data in combination with data from the last sample year, 1981, to revise estimates for the intervening years. NSF subsequently provided a second round of revisions to the 1982-85 R&D series. In both cases the revisions were done on an industry basis: an effort was made to apply the overall 1981-86 growth rates while preserving the relative year-to-year movements in each industry's R&D. This approach resulted in major revisions of the 1982-87 industry R&D time series previously published in *National Patterns*, especially of the nonfederally funded component of industry's R&D performance. The revised totals, as well as the industry data reported in the 1990 *National Patterns* (NSF 90-316), are presented in table B-3. (Some of these data have since been revised, but the revisions were unrelated to the drawing of a new sample.)[29] Additional details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the R&D expenditure data are contained in the 1990 edition (NSF 94-304) of the *Research and Development in Industry* series (*Industry R&D*).

Sample Design Revision in 1992. More recent surveys of industrial R&D performers have included revised R&D data based on relatively large industry samples. In contrast to data being based on probability samples selected around every 5 years, in 1992 NSF began to draw new samples annually, with the size of each sample increasing to approximately 24,000 firms. Industry classifications also were updated. The new sampling method now better reflects the widening population of R&D performers among firms in nonmanufacturing industries and small firms in all industries. As a result of these survey improvements, the revised 1991 industry R&D performance total ($117 billion) was 14 percent higher than was previously reported ($102.2 billion), and the national R&D total was 10 percent higher. These revisions were first reported in the 1994 *National Patterns* (NSF 95-304).

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[29] Note that although the Bureau of the Census reestimated 1982-86 R&D totals by funding source, it did not provide a character-of-work distribution for the revised data. After investigating several possible alternatives, NSF chose to allocate the revisions (table B-3) on the basis of average character-of-work distribution published in earlier annual *Research and Development in Industry* reports. Allocations for the federally funded and nonfederally funded R&D revisions were applied separately.

Of the $14.7 billion revision, $13.7 billion resulted from the new sample and $1.0 billion from normal data revisions for firms sampled in both surveys. Furthermore, $11.4 billion of the $13.7 billion increase stemming from the enlarged sample design was reported for nonmanufacturing industries, including $2.0 billion of R&D in industries not previously included in the sample frame. Complete technical details on industry's new survey methodology are contained in *Research and Development in Industry: 1992* (NSF 95-328).

As in previous sampling cycles, *National Patterns* includes revisions to the industry data for years intervening the two sample years (i.e., for 1988, 1989, and 1990). The industry and U.S. time series reported here include the wedged data reported for 1988-90 and the revised data for 1991-92. Table B-4 provides summary statistics for wedged data that appeared in the 1994 *National Patterns*, along with other data that were previously published.

For almost all of the aggregate statistics (for example, industry R&D by Federal and non-Federal sources of funding), NSF believes that time-series comparisons (for example, between 1981 and 1994 data) are still reasonable: Surveys undertaken in both years provided the best estimates of the Nation's industrial R&D performance total by sampling those industries then believed to be conducting R&D. However, changes in the survey series between some data elements for consecutive years may be problematic. Not only do the 1987 and 1992 surveys' sample size and frame differ considerably (see above), but $9.2 billion (in constant 1992 dollars) of R&D performed by firms reporting in both surveys was shifted from one industry in 1987 to another in 1992—primarily from manufacturing industries in 1987 to nonmanufacturing industries in 1992. Such classification shifts can be attributed to (1) product mix changes of individual firms that occurred some time between 1987 and 1992, (2) changes in the 1987 Standard Industrial Classification (SIC) that were effected in the 1992 survey, and (3) a change in the methodology used by NSF/Bureau of Census for classifying companies to specific two- and three-digit SIC industries. Given that NSF has, since 1992, been committed to drawing new samples annually, the issue of wedging, and the reporting biases it creates, is unlikely to recur.

Use of "Nonmanufacturing" as a Single Industrial Category. The enormous growth in, and increasing economic importance of, nonmanufacturing industries is common knowledge. Thus, listing a single nonmanufacturing sector which includes all services alongside such specific manufacturing sectors as lumber products is a somewhat archaic method of categorizing U.S. industries. Indeed, circumstances in the future may support the opposite taxonomy: a single sector called manufacturing, within a categorization scheme that delineates different types of services (e.g., health services, communication services, financial services). Use of the current categorization scheme for R&D statistics, however, is justified on the historical grounds that the vast majority of R&D performance takes place within the manufacturing sector.

The observation that R&D is carried out primarily in manufacturing, however, is a product of historical precedence in the interpretation of "where R&D is located" rather than reflecting any real distinction between manufactures and services in terms of the utilization of new technologies. Services are just as reliant upon technological change as manufactures. In particular, many new forms of equipment and materials that result in technological innovation in services derive from R&D in manufacturing where such equipment and materials are first made. Health services is a case in point. Continual innovation in medical services generally results from R&D in the manufacture of pharmaceuticals and new medical equipment. Because such R&D was carried out for the specific purpose of improving *services*, the attribution of such R&D to manufacturing rather than services is a matter of interpretation and precedence, not an absolute difference between the sectors in terms of their dependence on, or promotion of, scientific and engineering advances.[30]

Another issue is that services and manufactures often differ in the nature of the R&D that they conduct. As a result, the relative quantity of R&D measured for services, in comparison to manufactures, is dependent on how R&D is defined. For example, software development for particular computer entertainment packages, which would fall under services, would involve idea development that integrates computer science techniques with artistic creation. Whether such an activity would be classified as "R&D" would be a matter of interpretation and degree. In contrast, research on new hardware equipment would be much less subject to interpretation, and would tend to be automatically classified as R&D.

Cognizant of these changes in relationships between technology and R&D and between manufactures and services, NSF has expanded its coverage of the nonmanufacturing sector in its industry R&D surveys. As a consequence, nonmanufacturing firms as a group comprised approximately 25 percent of the total industrial R&D performance in 1994, compared with an estimated 11 percent share in 1988. In terms of dollars spent in 1994, among the largest nonmanufacturing performers were computer-related service firms ($6 billion) and research, development, and testing firms ($2 billion). In future publications, NSF hopes to report considerably more detail on the composition and location of nonmanufacturing R&D.

Character-of-Work Revisions. As first noted in the 1990 *National Patterns*, the procedures used by the Bureau of Census for imputing character-of-work splits for industry's R&D performance were changed for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. A full description of the various imputation methodologies—and alternatives—is presented in the 1988 *Industry R&D* report (NSF 90-319). Briefly, for 1985 and earlier years, for companies that did not report character-of-work splits, the Bureau of Census imputed the splits based on either (1) the company's percentage distribution reported in its most recent year of available data or (2) in the absence of any prior year breakdown for the company, the average character-of-work split for the industry to which the company was assigned. For years after 1985, the Bureau of Census does not impute a company's character-of-work distribution unless the company has reported a breakout within 2 years of the year being imputed. When distributions are not imputed, the Bureau of Census assigns the company's R&D to an "undistributed residual" category. (For example, and as detailed in table B-3, industry reported $96.7 billion in 1992 R&D performance with non-Federal funds; of that, the Bureau of Census did not distribute $16.4 billion.)

To provide character-of-work estimates for the entire population of firms performing R&D in the United States, each industry's (as contrasted with each individual company's) undistributed residual was allocated to basic research, applied research, and development categories using the average character-of-work splits reported for that industry. This approach resulted in relatively higher performance shares for basic and applied research than had been previously estimated and relatively lower estimates for development's share of industry's total R&D performance.

For 1994, $11.1 billion of the $97.1 billion in company-performed non-Federal R&D was not allocated to specific character-of-work categories by the reporting firms, nor was $1.3 billion of the company-reported Federal R&D total. Table B-5 provides the industry R&D category distributions used in this *National Patterns* as well as a historical summary for the years 1985-93.[31]

This *National Patterns* contains a major revision in industry's estimated basic research performance for the years 1991-94 from that published in the 1994 *National Patterns*. Previously, basic research was estimated to have almost doubled in 1991 (to $9.4 billion) from the company-reported $5 billion in 1990. The revised basic research amount for 1991 is $7.8 billion and approximately $7 billion for each year thereafter. The Census Bureau has since determined that several firms in the computer software service sector reported their R&D as basic research when development was the more appropriate reporting category. These changes have been made to the historical series.

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[30] For more detailed discussion on the interrelationship between R&D in manufacturing and advances in services, see, for example, B. Guile and J. Quinn, eds. *Technology in Services: Policies for Growth, Trade, and Employment* (Washington, DC: National Academy Press, 1988).

[31] See NSF, *Research and Development in Industry: 1992*, NSF 95-324, (Arlington, VA, 1995) for further discussion of this issue.

UNIVERSITIES AND COLLEGES

The academic sector, including all university-administered FFRDCs, has been surveyed annually since 1972 for R&D performance. It was surveyed less frequently before 1972. For 1994, data were collected from a sample of 500 institutions drawn from a population of 681 institutions of higher education in the United States and outlying areas that (1) granted a graduate degree in science or engineering and/or (2) performed activities for which at least $50,000 had been funded from separately budgeted R&D expenditures. The institutions sampled comprised all doctorate-granting institutions, all historically black colleges and universities with any R&D expenditures, and a random sample of all other institutions. For 1989-92, R&D performance was estimated from a census of institutions that granted doctorates in science and engineering plus a sample of all other universities and colleges. For 1993, data were collected from the full population of 681 institutions that met the criteria listed above.

Character-of-Work Revisions. With the exception of 1978, data on the basic research performance of universities and colleges and of university-administered FFRDCs have been collected annually since 1972. Since 1979, however, only the combined total for applied research and development performance has been collected. Furthermore, data on the character of work from individual non-Federal sources of funds (i.e., industry, institutional funds, State and local governments, and other sources) are not surveyed. For the years 1978 to the present, the distribution of applied research and development from Federal sources is based largely on data from *Federal Funds*; the development split from *each* of the non-Federal funding sources is calculated as approximately 7 percent of the surveyed non-Federal R&D funding totals; and the applied research share from *each* of the non-Federal funding sources is an estimated residual (total R&D funds, minus basic research funds, minus development funds).

Revised estimates for Federal funding of applied research and development to universities and colleges and to university-administered FFRDCs were first included in the 1992 *National Patterns*. University performers report the amount of R&D and basic research that they undertake with Federal funds. The residual is their combined applied research and development performance. The distribution between applied research and development is approximated based on the percentage shares of Federal obligation data to the academic sector as reported by Federal agencies in *Federal Funds*. Although the estimating procedures used previously had been loosely based on the data provided by the Federal funding agencies, the approach adopted here formally links performer- and source-reported survey data. Applied research and development expenditures for universities and colleges were revised for the period 1978 to the present; for university-administered FFRDCs, revisions were made back to 1975. The general result is that the applied research share is slightly lower and the development share higher than previously reported. For example, of the $9.0 billion in Federal R&D support to universities and colleges in 1989, $2.9 billion was for applied research and development and $6.1 billion was for basic research activities. In the 1990 *National Patterns*, $2.5 billion (28 percent of all Federal funds to the sector) was tabulated as applied research and $0.3 billion (3 percent) as development. In the 1992 *National Patterns* and in this report, 1989 Federal applied research funds are tabulated at $2.1 billion (24 percent) and development at $0.7 billion (8 percent). The revised totals, as well as the data reported in the 1990 *National Patterns*, are presented in table B-6.

Subcontracting. Only for the academic sector does R&D performance include research funds subcontracted to outside organizations. (For performance reported by respondents in the other surveyed sectors, R&D subcontracted to other organizations is excluded.) Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with R&D expenditure data are reported in the fiscal year (FY) 1994 report (NSF 96-308) of the *Academic Science and Engineering: R&D Expenditures (Academic R&D)* series. There is preliminary evidence from NSF surveys that approximately 3 percent of total academic R&D funds are passed through the university to other recipients.

OTHER NONPROFIT INSTITUTIONS

It has not been possible to maintain the same survey frequency for other nonprofit institutions; the last complete survey was conducted in 1973. Since then, small and informal surveys of this sector have been undertaken periodically, most recently for 1983. For the years 1984 to the present, estimates for federally funded total R&D and character-of-work performance by nonprofit institutions—including associated FFRDCs—are derived from Federal obligation data reported in *Federal Funds*. Industry as a source of R&D funds to this sector is approximated based on the average of the annual percentage change in (1) industry's funding of industry-performed R&D (from *Industry R&D)* and (2) industry funding of university-performed R&D (from *Academic R&D*). Nonprofit funding as a source of R&D funds to this sector is approximated based on the annual percentage change in nonprofit funding of university-performed R&D (from *Academic R&D*). The character-of-work splits from the non-Federal funding sources that were surveyed in 1983 are carried forward to the present.

DATA ANALYSIS

PRELIMINARY DATA AND PROJECTION PROCEDURES FOR 1995 AND 1996

To the greatest extent possible, this report incorporates data for 1995 and 1996 R&D programs included in the administration's 1997 budget proposal. For example, the 1997 budget contains data on total R&D outlays and budget authority by agency and by character of work. However, the budget does *not* contain reliable estimates on the amount of Federal R&D funds received by each of the R&D-performing economic sectors, but only the federally funded totals and funds received by universities and colleges. The detailed sector-specific information is obtained from an NSF survey of Federal agencies' R&D obligations. This information is collected after the President's proposed budget has been published. For this reason, some of the 1995 and 1996 Federal R&D data reported here are based on the administration's 1995 through 1997 budget proposals.

Preliminary R&D performance totals in *National Patterns* are calculated for each sector, by character of work, and by source of funds from surveys and time-series extrapolation techniques, as follows.

Federal Government. Projections for 1995 and 1996 are based on changes in intramural R&D obligations reported in *Federal Funds*. The amounts reported for 1995 are preliminary and reflect congressional appropriations, apportionments, and reprogramming decisions as of the third quarter of FY 1995. Data for 1996 are projections that reflect the reduction in intramural R&D represented in the administration's 1996 budget proposal.

Industry. Preliminary data for company-funded 1995 performance are based on (1) industry responses to the 1995 Industry R&D Survey, as of June 1996, which accounted for 44 percent of the R&D performed by industrial firms in 1994; (2) a mail survey conducted in August 1994 by the Industrial Research Institute (IRI) of its membership; and (3) data provided in the Standard and Poors Compustat Services database as of June 1996.[32] By the Compustat account, nominal corporate R&D spending of the top 100 firms is reported to increase 15 percent in 1995, compared with the 0.6 percent growth for 1995 projected by IRI members in the fall of 1994, and the 8 percent growth for 1995 reported in this *National Patterns.* Projections for 1996 are based on a mail survey completed by 151 IRI members in August and September 1995. Information on the 1996 IRI survey may be found in *Research Technology Management*, Vol. 39, No. 1, January-February 1996. Previously, NSF had conducted its own survey of companies' planned R&D expenditures.

Projections for 1995 and 1996 federally funded R&D performance are based on (1) time-series modeling for the Federal sector as a source of funds, supplemented by (2) Federal obligations data reported in *Federal Funds* (NSF, 97-302 and unpublished updates).

Universities and Colleges. Preliminary data for 1995 are based on university responses to the FY 1995 Academic R&D Survey, as of June 1996. These respondents accounted for 89 percent of the R&D performed by universities and colleges in FY 1994. Projections for 1996 are based on (1) Federal obligations to the academic sector reported in *Federal Funds* (NSF, 97-302 and unpublished updates) and (2) time-series modeled extrapolations of recent trends for each of the non-Federal sources.

Other Nonprofit Institutions. Preliminary tabulations for 1995 and 1996 are based on (1) Federal obligations reported in *Federal Funds* (NSF, 97-302) and (2) time-series modeled extrapolations of recent trends in R&D performance and funding within the industry and academic sectors, as outlined in the preceding section, "Performer Reporting Basis."

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[32] IRI is an independent, nonprofit association of over 260 R&D-performing companies. These companies represent the aerospace, automotive, chemical, computer, and electronics industries, among others, and carry out approximately 80 percent of the industrial research in the United States. Detailed results of the Compustat tabulations for the year 1995 may be found in *Inside R&D*, Vol. 25, No. 23, June 5, 1996.

Sector Summary. Table B-7 provides a concise listing of sectors for which performer-reported data, source-reported data, or a combination of the two are used; the general approaches adopted (for example, time-series techniques); and assumptions used in preliminary national expenditures on R&D, basic research, applied research, and development, all of which are outlined above. The table includes such information for the current projection years (1995-96), for finalized data of recent years (1992-94), and for a historical reference year (1973).

USE OF TIME-SERIES DATA

Data presented in trend tables are assembled from the most recently completed survey cycles. Data for prior years are reviewed for consistency with current year responses and—when necessary—revised in consultation with survey respondents. In addition, changes in sample design or imputation methodologies can result in revisions to previously published data. For trend comparisons, the historical data contained in this report should be used rather than the data published in previous *National Patterns* volumes.

GEOGRAPHIC DISTRIBUTION

This report contains information on the State distribution of R&D performance for 1993 (table C-16). These data cover R&D performance by Federal agencies, industry, academia, and the federally funded R&D activities of nonprofit institutions. The zero figures reported for some States in table C-16 represent R&D performance of less than $0.5 million. These State-distributed data are meant to be indicative of general distribution patterns; they may not be precise enough to warrant strong comparisons among similiar numbers.

The geographic data on 1987 R&D expenditures in the 1990 *National Patterns* included State agencies' intramural R&D performance that was obtained from a special NSF survey, reported on in *Research and Development Expenditures of State Government Agencies: Fiscal Years 1987 and 1988* (NSF 90-309). The estimates for 1993 provided here do not include this State agency component.

State-distributed data for the industry sector are collected for odd-numbered years. The latest available detailed data are for 1993 and are from *Industry R&D* (NSF 96-304). The data include R&D performance by industry-administered FFRDCs.

State-distributed data for the academic sector are collected only for doctorate-granting institutions and university-administered FFRDCs (*Academic R&D*). R&D performance by an FFRDC is assigned to the State in which the FFRDC is located, which is not necessarily the State in which the administering institution is located.

State-distributed data for Federal laboratories are intramural R&D obligations in FY 1993. These data are available from the 10 major R&D-supporting agencies (*Federal Funds*).

State-distributed data for other nonprofit institutions are Federal R&D obligations to this sector in FY 1993 as reported by the 10 major R&D-supporting Government agencies (*Federal Funds*). These agencies provided approximately 98 percent of total Federal R&D obligations in 1993. Data on R&D performance by this sector using non-Federal sources of funds are not collected.

HUMAN RESOURCES

The 1994 *National Patterns* was the first to include revised data on scientists and engineers (S&Es) engaged in R&D activities. This national series consists of separate survey estimates of R&D S&Es employed in industry and in the Federal Government and doctorate-holding R&D S&Es employed in educational institutions and in nonprofit organizations. The industry series are for S&Es employed on a full-time-equivalent (FTE) basis; totals for the other sectors reflect the primary work activity of S&Es.

A variety of surveys and estimation techniques are used to gather information on the numbers and characteristics of persons engaged in science and engineering activities in all sectors of the economy. In general, two types of surveys are used in reporting worker inputs for R&D: surveys directed at individuals and surveys directed at employers.

SURVEYS OF INDIVIDUALS

These surveys (in this report, of scientists and engineers holding doctorate degrees) result in data on the primary work activities and demographic and economic characteristics of the respondents. In the survey of doctoral scientists and engineers, respondents are asked to report their primary work activity—i.e., the activity on which they spend the largest proportion of their time, but which is not necessarily a full-time activity. This survey is conducted only in odd-numbered years. The latest tabulated data are available for 1993 and are summarized in table C-19. Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with these S&E data are in *Characteristics of Doctoral Scientists and Engineers in the United States: 1993* (NSF 96-302).

SURVEYS OF EMPLOYERS

These surveys generally are focused on the amount of time—in terms of person-years—devoted to the performance and management of R&D. In this report, data on the number of S&Es—not just those holding doctoral degrees—employed by industry on an FTE basis in R&D are summarized in table C-35. For example, if each of two scientists/engineers spends 50 percent of the workday on R&D, the equivalent is one FTE R&D job.

Previously, *National Patterns* provided national estimates of FTE R&D scientists and engineers. At one point, NSF had survey data for FTE estimates in all sectors of the economy. Currently, NSF collects such data only for the industrial sector. The last FTE R&D personnel survey of the academic sector was for 1985, and the last manpower survey of the nonprofit sector was for 1973, although a small telephone survey was conducted for 1983.

The loss of such survey data necessitated increased reliance on analytically derived figures (including the use of regression equations) which were based largely on estimating assumptions that could not be empirically tested for their continued validity. Consequently, those preliminary series are replaced here with survey counts of the number of doctorate-holding S&Es who self-report their primary work activity as R&D or R&D management. How well these head counts might approximate an FTE estimate is unknown. On the one hand, they may provide an overestimate of FTE activity since many of the surveyed S&Es are not engaged in R&D full-time even though it is their primary work activity. On the other hand, this approach may underestimate FTE R&D personnel since it does not account for S&Es engaged in R&D who do not hold a doctorate degree. Sources for the revised estimates and comparison with the 1985 and 1989 figures published in the 1992 *National Patterns*, are described and summarized in table B-8. For the total United States, the revised figures for 1989 (924,200) are 3 percent lower than previously reported (949,300).

Federal Government. For the Federal sector, survey data on civilian scientists and engineers are collected annually (*Federal Scientists and Engineers: 1989-93*, NSF 95-336). The estimates are compiled from the U.S. Office of Personnel Management's (OPM's) Central Personnel Data File on all white collar civilian jobs and are reported in terms of primary work activities. Scientists or engineers are included in the *National Patterns* totals if their primary work activity is research or development. These head counts exclude (1) military personnel (but include civilian S&Es employed in defense agencies) and (2) Federal employees classified in a management occupational code, even if they manage an R&D program. The earliest year for which these OPM statistics have been compiled is 1985. Data for 1985-89 published in the previous

National Patterns included estimates for R&D managers; these estimates are no longer included in the Federal totals. For years prior to 1985, the figures reported were based on NSF surveys since discontinued.

Industry. Industry is the only sector for which FTE R&D S&E survey estimates are available. Firms report (*Industry R&D*) FTE employment levels for January of each year, and a simple 2-year moving average is used for the national R&D S&E series. For example, the total reported for 1989 (733,000) is the average of the level reported by firms for January 1989 and January 1990. Except for minor data revisions resulting from the inclusion of wedged statistics, the industry totals reported here do not differ from those reported previously. As detailed above for the industry expenditure data, improvements in the sample design for 1992 and later years resulted in data that now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

Universities and Colleges. For the academic sector, two series are reported: doctoral scientists and engineers and graduate students performing research. The head counts for research students are from the Survey of Graduate Students and Postdoctorates in Science and Engineering and are for full-time science and engineering graduate students in all institutions whose major financial support is research assistantships. In this revised series, FTE estimates are derived assuming a 50 percent workload (or working half-time on R&D); previously, a 47 percent workload assumption was used.

Academic institutions were previously surveyed for estimates of FTE R&D S&Es; however, 1985 is the most recent year for which this survey was conducted. Since then, the academic estimates published in *National Patterns* were derived, usually, from a regression analysis of the 1975-85 academic FTE survey data based on the explanatory variables: (1) academic R&D expenditures and (2) the number of academic doctoral S&Es who reported R&D as their primary work activity. The revised series directly uses reported employment levels from the Survey of Doctorate Recipients (SDR). The academic R&D employment totals are of doctoral scientists and engineers employed in all educational institutions who self-report their primary work activity as "research," "development or design," or the "management or administration of R&D." No adjustments are made to derive FTEs. For 1989, the revised primary work activity total (83,500) is approximately 11% percent less than the FTE figure (93,700) last published in *National Patterns.* Because the doctoral data are collected only biennially, the revised national FTE series also are reported biennially.

NSF introduced a number of improvements into the 1991 SDR (for example, changes in the age-based cohorts collected and in the definition of doctoral scientists and engineers) that may affect comparability with SDR data published for prior survey years. The academic S&E total for those reporting R&D as their primary work activity for 1989 is 83,500 and the total for 1991 is 74,600. Whether changes in the survey design or in actual employment patterns caused the academic R&D S&E decline is unknown. The report *Characteristics of Doctoral Scientists and Engineers in the United States: 1991* (NSF 94-307) provides additional information on these methodological changes.

Other Nonprofit Institutions. The last survey of the nonprofit sector was for 1973. Since then, the nonprofit estimates published in *National Patterns* generally were based on survey data from the early 1970s and trends in the ratio of national R&D expenditures to FTE R&D S&Es. In the revised series, nonprofit R&D employment levels are taken from the Survey of Doctorate Recipients. The figures are for doctoral scientists and engineers employed in nonprofit organizations who self-report their primary work activity as "research," "development or design," or the "management or administration of R&D." These figures were not adjusted for part-time R&D activity or for R&D activity by nondoctoral scientists and engineers. For 1989, the revised primary work activity total (9,200) is approximately 75 percent less than the FTE figure (34,500) last published in *National Patterns*. The effect on the Nation's total FTE estimate is approximately a 2.7 percent downward revision.

LIST OF SUPPORTING DATA SOURCES ON R&D EXPENDITURES

Characteristics of Doctoral Scientists and Engineers in the United States: 1993 (NSF 96-302). Presents data on demographic and employment characteristics of the Nation's doctoral scientists and engineers. These characteristics include citizenship, place of birth, field of degree, occupation, sector of employment, median salary, and rates of employment.

Federal Scientists and Engineers: 1989-93, (NSF 95-336). Contains information on the status of Federal scientists and engineers. The report provides a descriptive analysis of various characteristics of Federal scientists and engineers, including the agency of employment, primary work activity, educational attainment, age, salary, and geographic location.

"Industrial Research Institute's Annual R&D Trends Forecast for 1996," *Research Technology Management*, Vol. 39, No. 1, January-February 1996, pp. 15-17. Provides a summary of expected 1996 industrial R&D activity and includes information on changes related to companies' R&D budgets (such as participation in consortia and hiring patterns). Report is based on a mail survey completed by the Industrial Research Institute's membership in August and September 1995.

National Science Board, *Science & Engineering Indicators: 1996*, NSB 96-21 (Washington, DC: U.S. Government Printing Office, 1996). Source of information on R&D and other science and engineering data. Published source of national R&D expenditures estimates for years when the biennial *National Patterns* report is not published.

National Science Foundation, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*, NSF 96-308 (Arlington, VA, 1996). Detailed statistical tables cover academic R&D performance as reported in a survey of U.S. universities and university-administered federally funded research and development centers. Data include distribution by source of funds, performing institution, character of work, field of science, and geographic location.

National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996*, (NSF 97-302) (Arlington, VA, 1997). Detailed statistical tables cover R&D (and R&D plant) funding levels through November 1995 as reported by all Federal agencies with R&D programs. Includes data by agency, performer, character of work, geographic distribution, and field of science and engineering.

National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 1995-97*, (NSF 97-301) (Arlington, VA, 1997). Provides information on Federal R&D budget authority by Federal budget function as proposed in the administration's 1997 budget.

National Science Foundation, *Research and Development in Industry: 1994*, (forthcoming) (Arlington, VA,1996). Detailed statistical tables cover industrial R&D performance as reported in a sample survey of companies. Data include distribution by source of funds, industry classification, character of work, product field, geographic location, company size, and other tabulations.

Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1997* (Washington, DC: U.S. Government Printing Office, 1996). Provides quantitative and qualitative information on R&D funding as proposed in the administration's 1997 budget.

APPENDIX B:
TABLES CORRESPONDING TO TECHNICAL NOTES

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Table B-1. Difference in agency-reported and performer-reported Federal R&D all performers, 1980-96

Year	Reported by Federal Agencies			Performer-reported Expenditures
	Authorizations	Obligations	Outlays	
	[millions of current dollars]			
1980	29,739	29,830	29,154	29,455
1981	33,735	33,104	32,459	33,415
1982	36,115	36,433	34,391	36,583
1983	38,768	38,712	36,659	40,838
1984	44,214	42,225	39,691	45,649
1985	49,887	48,360	44,171	52,128
1986	53,249	51,412	50,609	54,283
1987	57,069	55,254	51,612	57,914
1988	59,106	56,769	54,739	59,382
1989	62,115	61,406	59,450	59,799
1990	63,781	63,559	62,135	61,342
1991	65,898	61,295	61,130	60,120
1992	68,398	65,593	62,935	60,192
1993	69,884	67,314	65,241	60,323
1994	68,331	67,256	66,159	60,234
1995 (preliminary)	70,309	70,094	67,400	62,500
1996 (preliminary)	70,503	68,842	67,653	61,900

SOURCES: NSF/SRS, Survey of Federal Funds for Research and Development; Survey of Industrial Research and Development; Survey of Scientific & Engineering Expenditures at Universities and Colleges; and Office of Management and Budget, *Historical Tables, Budget of the United States Government-Fiscal Year 1997* (1996)

Table B-2. Difference in agency-reported and performer-reported Federal R&D industrial performers by agency source, 1980-94

Year	Industry Survey			Federal Survey			Difference in Report Totals		
	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies
	[millions of current dollars]								
1980	14,029			14,377			-348		
1981	16,382	10,540	5,842	16,282	10,931	5,351	100	-391	491
1982	18,545			18,698			-153		
1983	20,680	14,571	6,109	18,522	14,670	3,852	2,158	-99	2,257
1984	23,396			20,218			3,178		
1985	27,196	20,948	6,248	23,496	19,069	4,427	3,700	1,879	1,821
1986	27,891			25,898			1,993		
1987	30,757	22,252	8,505	28,629	24,258	4,371	2,128	-2,006	4,134
1988	30,343			28,630			1,713		
1989	28,554	NA	NA	30,603	25,043	5,560	-2,049	NA	NA
1990	28,125			31,696			-3,571		
1991	26,372	NA	NA	28,589	21,349	7,240	-2,217	NA	NA
1992	24,722			31,862			-7,140		
1993	22,809	15,044	7,765	31,777	23,856	7,921	-8,968	-8,812	-156
1994	22,463			31,748			-9,285		

KEY: NA=not available

NOTES: Data from the Industry Survey are R&D expenditures as reported by performing firms. Data from the Federal Survey are R&D obligations to industry as reported by Federal agencies. The last three columns report the difference between the two data series.

SOURCES: NSF/SRS, Survey of Federal Funds for Research and Development and Survey of Industrial Research and Development

Table B-3. Revisions in industry R&D performance totals: 1982-87

Year	Total R&D			Non-Federal funds			Federal funds		
	1989 National Patterns	Revision	1990 National Patterns	1989 National Patterns	Revision	1990 National Patterns	1989 National Patterns	Revision	1990 National Patterns
	[millions of current dollars]								
1982	57,995	655	58,650	39,512	593	40,105	18,483	62	18,545
1983	63,403	1,865	65,268	42,861	1,727	44,588	20,542	138	20,680
1984	71,470	3,330	74,800	48,308	3,096	51,404	23,162	234	23,396
1985	78,269	5,970	84,239	51,439	5,604	57,043	26,830	366	27,196
1986	80,631	7,548	88,179	52,848	7,084	59,932	27,783	464	28,247
1987	85,500	8,617	94,117	55,500	7,306	62,806	30,000	1,311	31,311

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources:1990.* These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

Table B-4. Revisions in industry R&D performance, and their impact on other variables: 1987-91

Year	Total industry R&D		Non-Federal funds to industry		Federal funds to industry	
	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns
	[millions of current dollars]					
1987	92,155	92,155	61,403	61,403	30,752	30,752
1988	97,889	97,015	65,772	66,672	32,117	30,343
1989	101,854	102,055	70,562	73,501	31,292	28,554
1990	104,606	109,727	73,980	81,602	30,626	28,125
1991	102,246	116,952	25,308	90,580	25,308	26,372

Table B-4. - Continued

Year	National R&D funds		R&D/GDP		Federal funds as percent of total		Defense R&D as percent of total	
	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns
	[millions of current dollars]							
1987	125,376	125,376	2.76	2.76	46.2	46.2	31.3	31.3
1988	133,764	132,890	2.73	2.71	45.8	44.8	30.2	29.5
1989	140,824	141,025	2.68	2.68	44.5	42.5	28.4	27.1
1990	146,424	151,545	2.64	2.73	43.7	40.6	27.0	25.1
1991	145,383	160,096	2.54	2.80	40.7	37.6	24.3	22.3

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources:1994.* These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

Table B-5 Distribution of industry R&D performance by character of work 1985-94

	Non-Federal funds					Federal funds				
	Census imputation					Census imputation				
Year	Total R&D	Basic research	Applied research	Development	Undistributed residual	Total R&D	Basic research	Applied research	Development	Undistributed residual
	[millions of current dollars]									
1985	57,043	2,140	11,640	37,659	5,604	27,196	482	5,275	21,073	366
1986	59,932	2,162	9,914	29,081	18,775	27,891	370	3,444	17,074	7,003
1987	61,403	2,332	10,558	30,819	17,694	30,752	534	3,510	18,770	7,938
1988	66,672	2,315	11,507	33,061	19,789	30,343	731	3,255	18,829	7,528
1989	73,501	2,741	13,328	37,599	19,833	28,554	1,050	3,567	16,224	7,713
1990	81,602	3,519	14,867	38,610	24,606	28,125	981	3,684	17,495	5,965
1991	90,580	5,270	17,511	51,568	16,231	26,372	1,220	4,808	14,749	5,595
1992	94,388	5,076	18,223	58,907	12,182	24,722	910	4,325	16,780	2,707
1993	94,591	5,345	17,345	60,991	10,910	22,809	952	4,698	16,561	598
1994	97,131	5,453	16,894	63,719	11,065	22,463	921	4,040	16,217	1,285
	Reported in 1996 National Patterns					Reported in 1996 National Patterns				
1985	57,043	2,373	12,908	41,762	0	27,196	489	5,347	21,360	0
1986	59,932	3,496	15,082	41,354	0	27,891	551	4,678	22,662	0
1987	61,403	3,583	15,153	42,667	0	30,752	740	4,660	25,352	0
1988	66,672	3,507	16,531	46,634	0	30,343	993	4,217	25,133	0
1989	73,501	3,832	17,993	51,676	0	28,554	1,384	4,698	22,472	0
1990	81,602	3,760	18,432	59,410	0	28,125	1,368	6,353	20,404	0
1991	90,580	6,125	21,425	63,030	0	26,372	1,712	6,021	18,639	0
1992	94,388	5,816	21,184	67,385	0	24,722	1,186	4,983	18,555	0
1993	94,591	5,961	19,956	68,678	0	22,809	958	4,730	17,118	0
1994	97,131	6,078	19,372	71,683	0	22,463	939	4,119	17,405	0

NOTES: Because of rounding, detail may not sum to totals. These methodological revisions were first reported for the years 1985-87 in *National Patterns of R&D Resources: 1990*; and for the years 1988-91 are being reported in this edition of National Patterns for the first time.

Table B-6. Revisions in university & college performance by Federal source of funds 1974-90

Year	Universities and colleges				University-administered FFRDCs			
	1990 National Patterns		1992 National Patterns		1990 National Patterns		1992 National Patterns	
	Applied research	Development	Applied research	Development	Applied research	Development	Applied research	Development
	[millions of current dollars]							
1974	438	71	438	71	178	297	178	297
1975	516	78	516	78	213	335	203	345
1976	584	87	584	87	264	371	235	400
1977	607	112	607	112	371	413	290	494
1978	673	122	644	194	431	419	319	531
1979	873	150	709	314	468	452	342	578
1980	1,043	200	880	361	503	619	424	698
1981	1,087	225	943	364	529	696	424	801
1982	1,142	225	957	406	606	556	430	732
1983	1,217	225	1,052	387	726	539	456	809
1984	1,401	200	1,187	410	804	671	541	934
1985	1,515	200	1,261	458	835	939	591	1,183
1986	1,611	225	1,329	512	774	1,262	565	1,471
1987	1,706	250	1,452	512	693	1,501	538	1,656
1988	2,229	275	1,857	694	697	1,612	534	1,775
1989	2,300	300	2,118	724	720	1,680	605	1,795
1990	2,325	325	2,219	857	740	1,760	630	1,799

KEY: FFRDC = federally funded research and development center

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1992.*
These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

Table B-7. Sources of data in compiling estimates on the level of R&D expenditures in the United States: 1973 and 1992-96

Year	United States	Federal Govt. Total used	Industry			Universities and colleges					U&C FFRDCs Total used	Other nonprofit institutions			
			Total used	Sources		Total used	Sources					Total used	Sources		
				Federal Govt.	Industry		Federal Govt.	Industry	U&C	Non-profits			Federal Govt.	Industry	Non-profits
	National expenditures for R&D, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
1992	A	P	P	P	P	P	P	P	P	P	P	A	S	Same as %	Same as %
1993	A	P	P	P	P	P	P	P	P	P	P	A	S	change of	change of
1994	A	P	P	P	P	P	P	P	P	P	P	A	S	industry	nonprofits
1995 (preliminary)	A	P	A	S-model	P	P	P	P	P	P	P	A	S	funds to	funds to
1996 (preliminary)	A	P	A	S-model	P	A	S-model	TS-model of EACH sector			TS-model	A	S	ind. & U&C	U&C
	National expenditures for basic research, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	---Telephone follow-up---			P	P	P	-----Estimated-----	
1992	A	P	P	P	P	P	P	Non-Federal basic as % of			P	A	S	Assumed:	Assumed:
1993	A	P	P	P	P	P	P	non-Federal total R&D			P	A	S	46	40
1994	A	P	P	P	P	P	P	Same for EACH sector			P	A	S	percent	percent
1995 (preliminary)	A	P	A	Percent share of		A	P	Time series model total			P	A	S	of	of
1996 (preliminary)	A	P	A	1994 R&D totals		A	S-model	non-Fed. basic research			TS-model	A	S	R&D	R&D
	National expenditures for applied research, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	---Telephone follow-up---			P	P	P	-----Estimated-----	
1992	A	P	P	P	P	A	P-S	For EACH non-Federal			P-S	A	S	Assumed:	Assumed:
1993	A	P	P	P	P	A	P-S	sector, applied research			P-S	A	S	34	36
1994	A	P	P	P	P	A	P-S	is the residual of total			P-S	A	S	percent	percent
1995 (preliminary)	A	P	A	Percent share of		A	S-model	R&D support minus basic			S-model	A	S	of	of
1996 (preliminary)	A	P	A	1994 R&D totals		A	S-model	research and development			S-model	A	S	R&D	R&D
	National expenditures for development, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	---Telephone follow-up---			P	P	P	-----Estimated-----	
1992	A	P	P	P	P	A	P-S	For EACH non-Federal			P-S	A	S	Assumed:	Assumed:
1993	A	P	P	P	P	A	P-S	sector, development			P-S	A	S	20	24
1994	A	P	P	P	P	A	P-S	equals 7% of reported			P-S	A	S	percent	percent
1995 (preliminary)	A	P	A	Percent share of		A	S-model	or modeled			S-model	A	S	of	of
1996 (preliminary)	A	P	A	1994 R&D totals		A	S-model	total R&D support			S-model	A	S	R&D	R&D

NOTE: Data are preliminary for 1995 and 1996.

KEY:
A = There is no single survey for this item. It is obtained by adding the appropriate expenditure details.
P = Based on surveys of R&D performers.
S = Based on surveys of Federal agencies which are the source of R&D funds.
P-S = Based on data from surveys of both performers and Federal agency sources.
S-model = Based on analytical or statistical models using Federal source-reported data.
TS-model = Based on times series modeling, such as Box-Jenkins techniques.
FFRDC = federally funded research and development center
U&C = universities and colleges

Table B-8. Revisions in number of R&D scientists and engineers: 1985 and 1989

Sector and primary work activity	1985		1989	
	Previous data	Revised data	Previous data	Revised data
	Thousands			
Total United States R&D scientists and engineers	841.6	801.9	949.3	924.2
Industry: Number of full-time equivalent R&D S&Es	646.8	646.8	726.0	733.1
Federal Government: Number of S&Es, Total	55.0	52.1	60.0	58.8
Research	22.3	22.3	22.9	24.6
Development	29.7	29.7	33.2	34.2
R&D management	2.9	--	3.9	--
Educational institutions: Full-time equivalent R&D S&Es, total	81.1	--	93.7	--
Doctoral S&Es, total	--	64.7	--	83.5
Basic research	--	43.6	--	52.7
Applied research	--	15.7	--	26.0
Development/design	--	1.4	--	0.9
Management/administration of R&D	--	4.0	--	3.9
FTE S&E graduate students with research assistantships	27.2	30.5	35.1	39.5
Nonprofit organizations: Full-time equivalent R&D S&Es, total	31.5	--	34.5	--
Doctoral S&Es, total	--	7.8	--	9.2
Basic research	--	3.4	--	3.8
Applied research	--	2.2	--	3.2
Development/design	--	0.5	--	0.5
Management/administration of R&D	--	1.7	--	1.7
R&D S&Es per 10,000 labor force	71.8	68.4	75.6	73.0

KEY: FTE = full-time equivalent

NOTES: These methodological revisions were first reported in *National Patterns of R&D Resources: 1994*. These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revision are not reflected in this table.

SOURCES: NSF/SRS, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, *Employment and Earnings* (annual)

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DETAILED STATISTICAL TABLES

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Table C-1. Gross domestic product and GDP implicit price deflators: 1953-99

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Year	GDP		GDP price deflator		Rates of inflation	
	Calendar year	Fiscal year	Calendar year	Fiscal year	Calendar year	Fiscal year
	Billions of current dollars		1987 = 1.00		Percent	
1953	370.0	363.4	0.220	0.219	--	
1954	370.9	367.4	0.222	0.221	0.9	0.9
1955	404.3	383.9	0.229	0.226	3.2	2.3
1956	426.2	415.2	0.236	0.234	3.1	3.5
1957	448.6	437.2	0.244	0.243	3.4	3.8
1958	454.7	447.1	0.249	0.249	2.0	2.5
1959	494.2	478.7	0.256	0.255	2.8	2.4
1960	513.4	505.9	0.260	0.261	1.6	2.4
1961	531.8	516.9	0.263	0.263	1.2	0.8
1962	571.6	554.3	0.269	0.268	2.3	1.9
1963	603.1	585.0	0.272	0.272	1.1	1.5
1964	648.0	626.5	0.277	0.276	1.8	1.5
1965	702.7	671.4	0.284	0.283	2.5	2.5
1966	769.8	738.6	0.294	0.291	3.5	2.8
1967	814.3	791.3	0.303	0.301	3.1	3.4
1968	889.3	849.8	0.318	0.312	5.0	3.7
1969	959.5	925.6	0.334	0.328	5.0	5.1
1970	1,010.7	985.6	0.352	0.346	5.4	5.5
1971	1,097.2	1,051.6	0.371	0.363	5.4	4.9
1972	1,207.0	1,145.8	0.398	0.382	4.6	5.2
1973	1,349.6	1,278.0	0.413	0.402	6.4	5.2
1974	1,458.6	1,403.3	0.449	0.433	8.7	7.7
1975	1,585.9	1,511.0	0.492	0.476	9.6	9.9
1976	1,768.4	1,685.1	0.523	0.512	6.3	7.6
1977	1,974.1	1,919.7	0.559	0.554	6.9	8.2
1978	2,232.7	2,156.4	0.603	0.596	7.9	7.6
1979	2,488.6	2,431.9	0.656	0.647	8.8	8.6
1980	2,708.0	2,644.5	0.717	0.706	9.3	9.1
1981	3,030.6	2,964.7	0.789	0.778	10.0	10.2
1982	3,149.6	3,124.9	0.838	0.836	6.2	7.5
1983	3,405.0	3,317.0	0.872	0.870	4.1	4.1
1984	3,777.2	3,696.7	0.910	0.909	4.4	4.5
1985	4,038.7	3,970.9	0.944	0.943	3.7	3.7
1986	4,268.6	4,219.6	0.969	0.971	2.6	3.0
1987	4,539.9	4,453.3	1.000	1.000	3.2	3.0

See explanatory information and SOURCE at end of table.

Table C-1. Gross domestic product and GDP implicit price deflators: 1953-99

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Year	GDP		GDP price deflator		Rates of inflation	
	Calendar year	Fiscal year	Calendar year	Fiscal year	Calendar year	Fiscal year
	Billions of current dollars		1987 = 1.00		Percent	
1988	4,900.4	4,810.0	1.039	1.036	3.9	3.6
1989	5,250.8	5,170.1	1.085	1.082	4.4	4.4
1990	5,546.1	5,481.5	1.133	1.120	4.4	3.5
1991	5,724.8	5,676.4	1.176	1.167	3.8	4.2
1992	6,020.2	5,921.5	1.209	1.201	2.8	2.9
1993	6,343.3	6,266.1	1.235	1.230	2.2	2.4
1994	6,738.4	6,633.6	1.261	1.254	2.1	2.0
1995	7,077.5	7,004.5	1.282	1.277	1.7	1.8
1996 (preliminary)	7,428.0	7,336.0	1.310	1.302	2.2	2.0
1997 (preliminary)	7,904.7	7,707.6	1.338	1.331	2.1	2.2
1998 (preliminary)	8,203.3	8,101.4	1.368	1.360	2.2	2.2
1999 (preliminary)	8,622.8	8,516.8	1.399	1.391	2.3	2.3

NOTES: Data are projected for 1996-99. Data for 1953-1995 are prior to comprehensive revisions that were published in January 1996 by the U.S. Department of Commerce, Buereau of Economic Analysis. The revised data, however, had not been carried back as far as 1953 at the time of this writing, and thus, the earlier data were used in this report for the purpose of historical consistency. Furthermore, for calculations that could be based on either data set, the similarity between the two data sets implied that the choice of data set would be inconsequential in terms of the relative magnitudes of reported statistical findings. Nevertheless, for interested data users, the most recent, postbenchmark figures on GDP and GDP deflators, now available for 1960 and later years, are provided at the end of this report, in table C-40.

SOURCES: Data for 1953-1995 are from the National Income and Product Accounts. Projections for 1996-1999 consistent with this historical series are from the Office of Management and Budget, *FY 1997 Budget of the United States Government.*

Table C-2. National expenditures for R&D, by performing sectors and sources of funds: 1955-96

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			Industry			Industry FFRDCs	Universities & colleges						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
				Sources				Sources							Sources			
Year	United States	Federal Govt. 1/	Total Used	Federal Govt.	Industry 2/	Federal Govt.	Total used	Federal Govt.	Nonfed. Govt.	Industry	U&Cs	Non-profits	Federal Govt. 3/	Total used	Federal Govt.	Industry	Non-profits	Federal Govt.
	Millions of current dollars																	
1955	6,172	905	4,517	2,057	2,460	123	312	169	47	25	41	30	180	127	60	35	32	8
1956	8,364	1,041	6,272	2,995	3,277	333	372	213	53	29	43	34	194	143	68	37	38	9
1957	9,775	1,220	7,324	3,928	3,396	407	410	229	60	34	49	38	240	161	73	37	51	13
1958	10,711	1,374	8,066	4,436	3,630	323	456	254	68	39	53	42	293	184	84	38	62	15
1959	12,357	1,639	9,200	5,217	3,983	418	526	306	76	39	58	47	338	215	106	42	67	21
1960	13,520	1,723	10,032	5,604	4,428	477	646	405	85	40	64	52	360	259	143	48	68	23
1961	14,320	1,878	10,353	5,685	4,668	555	763	500	95	40	70	58	410	288	153	49	86	73
1962	15,392	2,096	11,038	6,009	5,029	426	904	613	106	40	79	66	470	348	185	54	109	110
1963	17,059	2,279	12,216	6,856	5,360	414	1,081	760	118	41	89	73	530	389	215	55	119	150
1964	18,854	2,838	13,049	7,257	5,792	463	1,275	917	132	40	103	83	629	420	253	55	112	180
1965	20,044	3,093	13,812	7,367	6,445	373	1,474	1,073	143	41	124	93	629	433	247	62	124	230
1966	21,846	3,220	15,193	7,977	7,216	355	1,715	1,261	156	42	148	108	630	533	325	70	138	200
1967	23,146	3,396	15,966	7,946	8,020	419	1,921	1,409	164	48	181	119	673	551	332	74	145	220
1968	24,605	3,494	17,014	8,145	8,869	415	2,149	1,572	172	55	218	132	719	584	352	81	151	230
1969	25,629	3,501	17,844	7,987	9,857	464	2,225	1,600	197	60	223	145	725	630	376	93	161	240
1970	26,134	4,079	17,594	7,306	10,288	473	2,335	1,647	219	61	243	165	737	666	399	95	172	250
1971	26,676	4,228	17,829	7,175	10,654	491	2,500	1,724	255	70	274	177	716	702	420	98	184	210
1972	28,476	4,589	19,004	7,469	11,535	548	2,630	1,795	269	74	305	187	753	732	433	101	198	220
1973	30,718	4,762	20,704	7,600	13,104	545	2,884	1,985	295	84	318	202	817	826	510	105	211	180
1974	32,863	4,911	22,239	7,572	14,667	648	3,022	2,032	308	95	368	219	865	978	622	115	241	200
1975	35,213	5,354	23,460	7,878	15,582	727	3,409	2,288	332	113	417	259	987	1,056	655	125	276	220
1976	39,019	5,769	26,107	8,671	17,436	890	3,730	2,512	364	123	446	285	1,147	1,146	695	135	316	230
1977	42,783	6,012	28,863	9,523	19,340	962	4,067	2,726	374	139	514	314	1,384	1,235	727	150	358	260
1978	48,128	6,810	32,222	10,107	22,115	1,082	4,625	3,059	414	170	623	359	1,717	1,352	780	165	407	320
1979	54,939	7,418	37,062	11,354	25,708	1,164	5,366	3,598	472	193	735	368	1,935	1,624	980	180	464	370
1980	62,596	7,632	43,228	12,752	30,476	1,277	6,063	4,098	491	236	835	403	2,246	1,700	1,000	200	500	450
1981	71,870	8,426	50,425	14,997	35,428	1,385	6,848	4,571	546	292	1,004	435	2,486	1,750	1,000	225	525	550
1982	80,018	9,141	57,166	17,061	40,105	1,484	7,323	4,768	616	337	1,111	491	2,479	1,925	1,150	250	525	500
1983	89,144	10,582	63,683	19,095	44,588	1,585	7,882	4,989	626	389	1,302	576	2,737	2,075	1,250	275	550	600
1984	101,167	11,572	73,061	21,657	51,404	1,739	8,620	5,431	690	475	1,411	613	3,150	2,425	1,500	325	600	600

See explanatory information and SOURCE at end of table.

Table C-2. National expenditures for R&D, by performing sectors and sources of funds: 1955-96

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Year	United States	Federal Govt. 1/	Industry			Industry FFRDCs	Universities & colleges						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
				Sources				Sources							Sources			
			Total Used	Federal Govt.	Industry 2/	Federal Govt.	Total used	Federal Govt.	Nonfed. Govt.	Industry	U&Cs	Non-profits	Federal Govt. 3/	Total used	Federal Govt.	Industry	Non-profits	Federal Govt.
	Millions of current dollars																	
1985	113,819	12,945	82,376	25,333	57,043	1,863	9,687	6,064	752	560	1,617	694	3,523	2,725	1,700	375	650	700
1986	119,556	13,535	85,932	26,000	59,932	1,891	10,928	6,712	915	700	1,869	732	3,895	2,825	1,700	425	700	550
1987	125,376	13,413	90,160	28,757	61,403	1,995	12,152	7,343	1,023	790	2,168	828	4,206	2,950	1,700	450	800	500
1988	132,723	14,115	94,893	28,221	66,672	2,122	13,462	8,193	1,106	872	2,356	935	4,531	3,100	1,700	500	900	500
1989	140,836	15,025	99,860	26,359	73,501	2,195	14,976	8,990	1,223	995	2,697	1,071	4,730	3,550	2,000	550	1,000	500
1990	151,392	15,849	107,404	25,802	81,602	2,323	16,284	9,636	1,323	1,128	3,006	1,191	4,832	4,100	2,300	650	1,150	600
1991	159,997	15,138	114,675	24,095	90,580	2,277	17,579	10,232	1,473	1,205	3,362	1,307	5,078	4,550	2,600	700	1,250	700
1992	164,398	15,583	116,757	22,369	94,388	2,353	18,808	11,090	1,491	1,280	3,538	1,409	5,247	4,900	2,800	750	1,350	750
1993	165,048	16,663	115,435	20,844	94,591	1,965	19,940	11,956	1,559	1,361	3,578	1,486	5,295	5,000	2,850	750	1,400	750
1994	168,085	16,139	117,392	20,261	97,131	2,202	21,081	12,661	1,562	1,430	3,838	1,590	5,271	5,250	2,950	800	1,500	750
1995 (prelim.)	178,550	16,400	126,600	21,600	105,000	2,100	21,900	13,200	1,600	1,500	4,000	1,600	5,400	5,400	3,050	800	1,550	750
1996 (prelim.)	184,300	16,200	132,100	21,100	111,000	2,100	22,400	13,400	1,600	1,600	4,200	1,600	5,400	5,300	2,900	850	1,550	800

1/ Total funds used by the Federal Government are from Federal sources.

2/ Industry sources of industry R&D expenditures include all non-Federal sources of industry R&D expenditures.

3/ Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. In 1994, 99 percent of total funds used were from Federal sources.

KEY: FFRDC = Federally funded research and development centers
U&C = university and college

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1995 and 1996. As a result of a new sample design for the underlying Survey of Industrial R&D, statistics for 1988-92 were revised and first reported in *National Patterns of R&D Resources: 1994*. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures: Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996*; NSF/SRS; industry data available in Standard and Poors Compustat; and an independent survey conducted by the Industrial Research Institute.

Table C-3. Sources of funds for research and development, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1953	5,124	2,753	2,245	72	54	23,320	12,540	10,205	329	246
1954	5,644	3,132	2,373	80	59	25,453	14,135	10,690	362	266
1955	6,172	3,502	2,520	88	62	27,033	15,365	11,006	389	272
1956	8,364	4,853	3,343	96	72	35,499	20,616	14,166	410	306
1957	9,775	6,110	3,467	109	89	40,093	25,069	14,210	449	365
1958	10,711	6,779	3,707	121	104	43,016	27,225	14,888	486	418
1959	12,357	8,045	4,064	134	114	48,308	31,461	15,876	525	446
1960	13,520	8,735	4,516	149	120	51,960	33,559	17,369	571	461
1961	14,320	9,254	4,757	165	144	54,449	35,186	18,087	627	548
1962	15,392	9,909	5,123	185	175	57,267	36,881	19,045	690	651
1963	17,059	11,204	5,456	207	192	62,717	41,191	20,059	761	706
1964	18,854	12,537	5,887	235	195	68,127	45,317	21,253	851	705
1965	20,044	13,012	6,548	267	217	70,642	45,877	23,057	943	765
1966	21,846	13,968	7,328	304	246	74,501	47,689	24,927	1,045	841
1967	23,146	14,395	8,142	345	264	76,521	47,628	26,872	1,146	874
1968	24,605	14,927	9,005	390	283	77,759	47,290	28,321	1,250	898
1969	25,629	14,893	10,010	420	306	77,087	44,909	29,973	1,280	924
1970	26,134	14,891	10,444	462	337	74,597	42,622	29,673	1,335	966
1971	26,676	14,964	10,822	529	361	72,345	40,730	29,174	1,457	984
1972	28,476	15,807	11,710	574	385	73,714	41,029	30,183	1,503	1,000
1973	30,718	16,399	13,293	613	413	74,938	40,208	32,192	1,525	1,013
1974	32,863	16,850	14,877	676	460	73,916	38,170	33,141	1,561	1,043
1975	35,213	18,109	15,820	749	535	72,237	37,396	32,162	1,574	1,105
1976	39,019	19,914	17,694	810	601	75,043	38,464	33,837	1,582	1,161
1977	42,783	21,594	19,629	888	672	76,720	38,793	35,117	1,603	1,207
1978	48,128	23,875	22,450	1,037	766	80,070	39,819	37,234	1,740	1,277
1979	54,939	26,819	26,081	1,207	832	84,061	41,157	39,762	1,866	1,276
1980	62,596	29,455	30,912	1,326	903	87,649	41,385	43,118	1,878	1,268
1981	71,870	33,415	35,945	1,550	960	91,408	42,629	45,563	1,992	1,225
1982	80,018	36,583	40,692	1,727	1,016	95,541	43,702	48,559	2,066	1,214

See explanatory information and SOURCE at end of table.

Table C-3. Sources of funds for research and development, by sector: 1953-96

Page 2 of 2

Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1983	89,144	40,838	45,252	1,928	1,126	102,285	46,881	51,896	2,216	1,293
1984	101,167	45,649	52,204	2,101	1,213	111,201	50,188	57,368	2,311	1,334
1985	113,819	52,128	57,978	2,369	1,344	120,600	55,246	61,418	2,512	1,425
1986	119,556	54,283	61,057	2,784	1,432	123,321	55,968	63,009	2,867	1,476
1987	125,376	57,914	62,643	3,191	1,628	125,376	57,914	62,643	3,191	1,628
1988	132,723	59,382	68,044	3,462	1,835	127,831	57,228	65,492	3,342	1,769
1989	140,836	59,799	75,046	3,920	2,071	129,892	55,188	69,169	3,623	1,911
1990	151,392	61,342	83,380	4,329	2,341	133,999	54,452	73,604	3,865	2,078
1991	159,997	60,120	92,485	4,835	2,557	136,300	51,322	78,652	4,143	2,183
1992	164,398	60,192	96,418	5,029	2,759	136,197	49,962	79,757	4,187	2,290
1993	165,048	60,323	96,702	5,137	2,886	133,780	48,956	78,306	4,176	2,342
1994	168,085	60,234	99,361	5,400	3,090	133,483	47,918	78,802	4,306	2,457
1995 (prel.)	178,550	62,500	107,300	5,600	3,150	139,408	48,859	83,702	4,385	2,462
1996 (prel.)	184,300	61,900	113,450	5,800	3,150	140,893	47,416	86,611	4,455	2,412

1/ Industry sources of industry R&D expenditures include all non-Federal sources of industry R&D performance.

2/ University and college sources of R&D include university and college R&D performance supported by State and local governments.

3/ Nonprofit sources of R&D include nonprofit performance supported by State and local governments.

4/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTES: Data are preliminary for 1995 and 1996. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995 and 1996*; industry data available in Standard and Poors Compustat; and an independent survey conducted by the Industrial Research Institute.

Table C-4. Research and development performance, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1953	5,124	1,010	3,630	255	121	108	23,320	4,612	16,500	1,164	553	491
1954	5,644	1,020	4,070	290	141	123	25,453	4,615	18,333	1,312	638	554
1955	6,172	905	4,640	312	180	135	27,033	4,004	20,262	1,381	796	590
1956	8,364	1,041	6,605	372	194	152	35,499	4,449	27,987	1,590	829	644
1957	9,775	1,220	7,731	410	240	174	40,093	5,021	31,684	1,687	988	713
1958	10,711	1,374	8,389	456	293	199	43,016	5,518	33,691	1,831	1,177	799
1959	12,357	1,639	9,618	526	338	236	48,308	6,427	37,570	2,063	1,325	922
1960	13,520	1,723	10,509	646	360	282	51,960	6,602	40,419	2,475	1,379	1,085
1961	14,320	1,878	10,908	763	410	361	54,449	7,141	41,475	2,901	1,559	1,373
1962	15,392	2,096	11,464	904	470	458	57,267	7,821	42,617	3,373	1,754	1,703
1963	17,059	2,279	12,630	1,081	530	539	62,717	8,379	46,434	3,974	1,949	1,982
1964	18,854	2,838	13,512	1,275	629	600	68,127	10,283	48,780	4,620	2,279	2,166
1965	20,044	3,093	14,185	1,474	629	663	70,642	10,929	49,947	5,208	2,223	2,335
1966	21,846	3,220	15,548	1,715	630	733	74,501	11,065	52,884	5,893	2,165	2,493
1967	23,146	3,396	16,385	1,921	673	771	76,521	11,282	54,076	6,382	2,236	2,545
1968	24,605	3,494	17,429	2,149	719	814	77,759	11,199	54,808	6,888	2,304	2,560
1969	25,629	3,501	18,308	2,225	725	870	77,087	10,674	54,814	6,784	2,210	2,605
1970	26,134	4,079	18,067	2,335	737	916	74,597	11,789	51,327	6,749	2,130	2,602
1971	26,676	4,228	18,320	2,500	716	912	72,345	11,647	49,380	6,887	1,972	2,458
1972	28,476	4,589	19,552	2,630	753	952	73,714	12,013	50,392	6,885	1,971	2,454
1973	30,718	4,762	21,249	2,884	817	1,006	74,938	11,846	51,450	7,174	2,032	2,436
1974	32,863	4,911	22,887	3,022	865	1,178	73,916	11,342	50,973	6,979	1,998	2,624
1975	35,213	5,354	24,187	3,409	987	1,276	72,237	11,248	49,161	7,162	2,074	2,593
1976	39,019	5,769	26,997	3,730	1,147	1,376	75,043	11,268	51,620	7,285	2,240	2,631
1977	42,783	6,012	29,825	4,067	1,384	1,495	76,720	10,852	53,354	7,341	2,498	2,674
1978	48,128	6,810	33,304	4,625	1,717	1,672	80,070	11,426	55,231	7,760	2,881	2,773
1979	54,939	7,418	38,226	5,366	1,935	1,994	84,061	11,465	58,271	8,294	2,991	3,040
1980	62,596	7,632	44,505	6,063	2,246	2,150	87,649	10,810	62,071	8,588	3,181	2,999
1981	71,870	8,426	51,810	6,848	2,486	2,300	91,408	10,830	65,665	8,802	3,195	2,915
1982	80,018	9,141	58,650	7,323	2,479	2,425	95,541	10,934	69,988	8,760	2,965	2,894

See explanatory information and SOURCE at end of table.

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Table C-4. Research and development performance, by sector: 1953-96

Page 2 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1983	89,144	10,582	65,268	7,882	2,737	2,675	102,285	12,163	74,849	9,060	3,146	3,068
1984	101,167	11,572	74,800	8,620	3,150	3,025	111,201	12,730	82,198	9,483	3,465	3,324
1985	113,819	12,945	84,239	9,687	3,523	3,425	120,600	13,727	89,236	10,273	3,736	3,628
1966	119,556	13,535	87,823	10,928	3,895	3,375	123,321	13,939	90,633	11,254	4,011	3,483
1987	125,376	13,413	92,155	12,152	4,206	3,450	125,376	13,413	92,155	12,152	4,206	3,450
1988	132,723	14,115	97,015	13,462	4,531	3,600	127,831	13,625	93,373	12,994	4,374	3,465
1989	140,836	15,025	102,055	14,976	4,730	4,050	129,892	13,886	94,060	13,841	4,372	3,733
1990	151,392	15,849	109,727	16,284	4,832	4,700	133,999	14,151	96,846	14,539	4,314	4,148
1991	159,997	15,138	116,952	17,579	5,078	5,250	136,300	12,972	99,449	15,063	4,351	4,464
1992	164,398	15,583	119,110	18,808	5,247	5,650	136,197	12,975	98,519	15,660	4,369	4,673
1993	165,048	16,663	117,400	19,940	5,295	5,750	133,780	13,547	95,061	16,211	4,305	4,656
1994	168,085	16,139	119,594	21,081	5,271	6,000	133,483	12,870	94,841	16,811	4,203	4,758
1995 (prel.)	178,550	16,400	128,700	21,900	5,400	6,150	139,408	12,843	100,390	17,150	4,229	4,797
1996 (prel.)	184,300	16,200	134,200	22,400	5,400	6,100	140,893	12,442	102,443	17,204	4,147	4,656

1/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: FFRDC = federally funded research & development center
U&C = university and college

NOTES: Data are preliminary for 1995 and 1996. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996*; industry data available in Standard and Poors Compustat; and an independent survey conducted by the Industrial Research Institute.

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Table C-5. National basic research expenditures: 1953-96

Year	United States	Federal Govt. 1/	Industry 2/			Universities & colleges					U&C FFRDCs 6/	Other nonprofit institutions 2/			
			Total used	Sources		Total used	Sources 4/					Total used	Sources		
				Federal Govt.	Industry 3/		Federal Govt.	Industry	U&Cs 5/	Non-profits			Federal Govt.	Industry	Non-profits 5/
	Millions of current dollars														
1953	441	101	151	19	132	110	73	12	10	15	33	46	25	9	12
1954	496	102	166	23	143	136	90	14	15	17	39	53	29	11	13
1955	547	90	189	27	162	159	103	16	21	19	49	60	33	13	14
1956	680	105	253	37	216	200	130	18	30	22	51	71	39	15	17
1957	780	122	271	41	230	240	155	21	39	25	65	82	44	15	23
1958	877	126	295	43	252	281	178	24	50	29	78	97	53	16	28
1959	1,039	172	320	72	248	343	226	24	60	33	92	112	64	18	30
1960	1,194	157	376	79	297	433	299	24	72	38	97	131	80	21	30
1961	1,405	210	395	81	314	536	382	25	85	44	115	149	90	22	37
1962	1,722	249	488	143	345	659	481	25	102	51	136	190	120	24	46
1963	1,965	255	522	147	375	814	610	25	121	58	159	215	140	25	50
1964	2,289	314	549	165	384	1,003	768	24	144	67	191	232	160	25	47
1965	2,555	364	592	186	406	1,138	879	26	164	69	208	253	172	29	52
1966	2,814	385	624	173	451	1,303	1,008	27	197	71	227	275	185	32	58
1967	3,056	435	629	202	427	1,457	1,124	31	223	79	250	285	190	34	61
1968	3,297	432	642	180	462	1,650	1,251	36	276	87	276	297	197	37	63
1969	3,441	532	618	160	458	1,711	1,279	39	298	95	275	305	195	43	67
1970	3,531	559	602	158	444	1,796	1,296	40	350	110	269	305	189	44	72
1971	3,652	566	590	134	456	1,914	1,349	46	400	119	260	322	200	45	77
1972	3,801	597	593	130	463	2,022	1,420	53	415	134	244	345	214	47	84
1973	3,945	608	631	132	499	2,053	1,454	57	408	134	296	357	218	49	90
1974	4,343	696	699	163	536	2,153	1,523	60	431	139	390	405	245	54	106
1975	4,738	734	730	157	573	2,410	1,695	72	477	166	439	425	245	60	120
1976	5,130	786	819	185	634	2,549	1,841	71	475	162	512	464	265	64	135
1977	5,735	914	911	210	701	2,800	2,007	79	527	187	600	510	290	70	150
1978	6,649	1,029	1,035	250	785	3,133	2,221	99	605	208	867	585	335	80	170
1979	7,568	1,089	1,158	265	893	3,619	2,577	114	711	217	1,022	680	400	85	195
1980	8,435	1,182	1,325	290	1,035	4,036	2,861	141	793	241	1,132	760	450	95	215
1981	9,606	1,302	1,614	301	1,313	4,595	3,261	171	908	255	1,270	825	495	105	225
1982	10,440	1,465	1,904	381	1,523	4,879	3,402	195	998	284	1,327	865	535	115	215

See explanatory information and SOURCE at end of table.

Table C-5. National basic research expenditures: 1953-96

Year	United States	Federal Govt. 1/	Industry 2/			Universities & colleges					U&C FFRDCs 6/	Other nonprofit institutions 2/			
				Sources			Sources 4/						Sources		
			Total used	Federal Govt.	Industry 3/	Total used	Federal Govt.	Industry	U&Cs 5/	Non-profits		Total used	Federal Govt.	Industry	Non-profits 5/
	Millions of current dollars														
1983	11,645	1,690	2,223	463	1,760	5,303	3,547	236	1,170	350	1,484	945	600	125	220
1984	12,933	1,861	2,608	476	2,132	5,734	3,830	283	1,255	366	1,690	1,040	650	150	240
1985	14,211	1,923	2,862	489	2,373	6,556	4,343	342	1,447	424	1,765	1,105	675	170	260
1986	16,614	2,019	4,047	551	3,496	7,492	4,867	436	1,733	456	1,876	1,180	700	200	280
1987	18,025	2,046	4,323	740	3,583	8,393	5,375	496	2,002	520	2,033	1,230	700	210	320
1988	19,029	2,050	4,500	993	3,507	8,894	5,678	532	2,113	571	2,245	1,340	750	230	360
1989	21,171	2,313	5,216	1,384	3,832	9,790	6,194	598	2,355	643	2,352	1,500	850	250	400
1990	22,253	2,295	5,128	1,368	3,760	10,642	6,646	678	2,602	716	2,428	1,760	1,000	300	460
1991	26,347	2,392	7,837	1,712	6,125	11,603	7,125	734	2,947	797	2,595	1,920	1,100	320	500
1992	26,736	2,338	7,002	1,186	5,816	12,513	7,715	796	3,126	876	2,843	2,040	1,150	350	540
1993	27,981	2,662	6,919	958	5,961	13,302	8,397	836	3,156	913	2,938	2,160	1,250	350	560
1994	28,796	2,505	7,017	939	6,078	14,096	8,945	875	3,303	973	3,008	2,170	1,200	370	600
1995 (prelim.)	29,390	2,500	7,000	1,000	6,000	14,700	9,300	900	3,500	1,000	3,000	2,190	1,200	370	620
1996 (prelim.)	29,760	2,500	6,900	900	6,000	15,100	9,500	1,000	3,600	1,000	3,000	2,260	1,250	390	620

1/ Total funds used by Federal Government are from Federal sources.

2/ Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

3/ Industry R&D expenditures include all non-Federal sources of funds.

4/ Distribution by non-Federal sources has been estimated for all years.

5/ Includes R&D funds from State and local government sources.

6/ Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia.

KEY: FFRDC = federally funded research and development centers
U&C = university and college

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1995 and 1996. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988-92 were revised and first reported in *National Patterns of R&D Resources: 1994*. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development; Fiscal Years 1994, 1995, and 1996.*

Table C-6. Sources of funds for basic research, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1953	441	251	153	10	27	2,010	1,145	696	46	123
1954	496	283	168	15	30	2,240	1,279	757	68	135
1955	547	302	191	21	33	2,406	1,333	835	93	145
1956	680	362	249	30	39	2,894	1,544	1,056	128	166
1957	780	427	266	39	48	3,204	1,756	1,091	160	197
1958	877	478	292	50	57	3,522	1,920	1,173	201	229
1959	1,039	626	290	60	63	4,068	2,453	1,133	235	247
1960	1,194	712	342	72	68	4,582	2,730	1,315	276	261
1961	1,405	878	361	85	81	5,342	3,338	1,373	323	308
1962	1,722	1,129	394	102	97	6,416	4,209	1,465	381	361
1963	1,965	1,311	425	121	108	7,224	4,820	1,563	445	397
1964	2,289	1,598	433	144	114	8,283	5,786	1,563	522	412
1965	2,555	1,809	461	164	121	9,018	6,388	1,624	580	427
1966	2,814	1,978	510	197	129	9,639	6,785	1,736	677	441
1967	3,056	2,201	492	223	140	10,133	7,304	1,624	741	464
1968	3,297	2,336	535	276	150	10,511	7,464	1,685	885	477
1969	3,441	2,441	540	298	162	10,440	7,423	1,619	909	490
1970	3,531	2,471	528	350	182	10,161	7,125	1,502	1,012	522
1971	3,652	2,509	547	400	196	10,006	6,892	1,477	1,102	535
1972	3,801	2,605	563	415	218	9,912	6,805	1,453	1,086	567
1973	3,945	2,708	605	408	224	9,748	6,713	1,469	1,015	551
1974	4,343	3,017	650	431	245	9,939	6,934	1,453	995	557
1975	4,738	3,270	705	477	286	9,875	6,842	1,438	1,002	593
1976	5,130	3,589	769	475	297	9,967	6,991	1,473	928	575
1977	5,735	4,021	850	527	337	10,329	7,250	1,522	951	606
1978	6,649	4,702	964	605	378	11,124	7,878	1,601	1,015	631
1979	7,568	5,353	1,092	711	412	11,658	8,259	1,667	1,099	633
1980	8,435	5,915	1,271	793	456	11,902	8,362	1,776	1,123	641
1981	9,606	6,629	1,589	908	480	12,303	8,506	2,017	1,167	613
1982	10,440	7,110	1,833	998	499	12,480	8,502	2,188	1,194	596

See explanatory information and SOURCE at end of table.

Table C-6. Sources of funds for basic research, by sector: 1953-96

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Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1983	11,645	7,784	2,121	1,170	570	13,377	8,944	2,433	1,345	655
1984	12,933	8,507	2,565	1,255	606	14,223	9,357	2,819	1,381	666
1985	14,211	9,195	2,885	1,447	684	15,066	9,749	3,057	1,534	725
1986	16,614	10,013	4,132	1,733	736	17,121	10,315	4,263	1,785	759
1987	18,025	10,894	4,289	2,002	840	18,025	10,894	4,289	2,002	840
1988	19,029	11,716	4,269	2,113	931	18,351	11,304	4,110	2,040	898
1989	21,171	13,093	4,680	2,355	1,043	19,549	12,095	4,315	2,177	963
1990	22,253	13,737	4,738	2,602	1,176	19,798	12,241	4,189	2,323	1,045
1991	26,347	14,924	7,179	2,947	1,297	22,513	12,770	6,109	2,525	1,108
1992	26,736	15,232	6,962	3,126	1,416	22,212	12,670	5,763	2,603	1,176
1993	27,981	16,205	7,147	3,156	1,473	22,719	13,168	5,790	2,566	1,196
1994	28,796	16,597	7,323	3,303	1,573	22,923	13,226	5,811	2,634	1,252
1995 (preliminary)	29,390	17,000	7,270	3,500	1,620	22,987	13,306	5,674	2,741	1,267
1996 (preliminary)	29,760	17,150	7,390	3,600	1,620	22,814	13,162	5,646	2,765	1,241

1/ Industry sources of industry R&D expenditures include all non-Federal sources of industry R&D performance.

2/ University and college sources of R&D include university and college R&D performance supported by State and local governments.

3/ Nonprofit sources of R&D include nonprofit performance supported by State and local governments.

4/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994; NSF/SRS, Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.*

Table C-7. Basic research performance, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1953	441	101	151	110	33	46	2,010	461	686	502	151	209
1954	496	102	166	136	39	53	2,240	462	748	615	176	239
1955	547	90	189	159	49	60	2,406	398	825	704	217	262
1956	680	105	253	200	51	71	2,894	449	1,072	855	218	301
1957	780	122	271	240	65	82	3,204	502	1,111	988	267	336
1958	877	126	295	281	78	97	3,522	506	1,185	1,129	313	390
1959	1,039	172	320	343	92	112	4,068	675	1,250	1,345	361	438
1960	1,194	157	376	433	97	131	4,582	602	1,446	1,659	372	504
1961	1,405	210	395	536	115	149	5,342	798	1,502	2,038	437	567
1962	1,722	249	488	659	136	190	6,416	929	1,814	2,459	507	706
1963	1,965	255	522	814	159	215	7,224	938	1,919	2,993	585	790
1964	2,289	314	549	1,003	191	232	8,283	1,138	1,982	3,634	692	838
1965	2,555	364	592	1,138	208	253	9,018	1,286	2,085	4,021	735	891
1966	2,814	385	624	1,303	227	275	9,639	1,323	2,122	4,478	780	935
1967	3,056	435	629	1,457	250	285	10,133	1,445	2,076	4,841	831	941
1968	3,297	432	642	1,650	276	297	10,511	1,385	2,019	5,288	885	934
1969	3,441	532	618	1,711	275	305	10,440	1,622	1,850	5,216	838	913
1970	3,531	559	602	1,796	269	305	10,161	1,616	1,710	5,191	777	866
1971	3,652	566	590	1,914	260	322	10,006	1,559	1,590	5,273	716	868
1972	3,801	597	593	2,022	244	345	9,912	1,563	1,528	5,293	639	889
1973	3,945	608	631	2,053	296	357	9,748	1,512	1,528	5,107	736	864
1974	4,343	696	699	2,153	390	405	9,939	1,607	1,557	4,972	901	902
1975	4,738	734	730	2,410	439	425	9,875	1,542	1,484	5,063	922	864
1976	5,130	786	819	2,549	512	464	9,967	1,535	1,566	4,979	1,000	887
1977	5,735	914	911	2,800	600	510	10,329	1,650	1,630	5,054	1,083	912
1978	6,649	1,029	1,035	3,133	867	585	11,124	1,727	1,716	5,257	1,455	970
1979	7,568	1,089	1,158	3,619	1,022	680	11,658	1,683	1,765	5,594	1,580	1,037
1980	8,435	1,182	1,325	4,036	1,132	760	11,902	1,674	1,848	5,717	1,603	1,060
1981	9,606	1,302	1,614	4,595	1,270	825	12,303	1,674	2,046	5,906	1,632	1,046
1982	10,440	1,465	1,904	4,879	1,327	865	12,480	1,752	2,272	5,836	1,587	1,032

See explanatory information and SOURCE at end of table.

Table C-7. Basic research performance, by sector: 1953-96

Page 2 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1983	11,645	1,690	2,223	5,303	1,484	945	13,377	1,943	2,549	6,095	1,706	1,084
1984	12,933	1,861	2,608	5,734	1,690	1,040	14,223	2,047	2,866	6,308	1,859	1,143
1985	14,211	1,923	2,862	6,556	1,765	1,105	15,066	2,039	3,032	6,952	1,872	1,171
1986	16,614	2,019	4,047	7,492	1,876	1,180	17,121	2,079	4,176	7,716	1,932	1,218
1987	18,025	2,046	4,323	8,393	2,033	1,230	18,025	2,046	4,323	8,393	2,033	1,230
1988	19,029	2,050	4,500	8,894	2,245	1,340	18,351	1,979	4,331	8,585	2,167	1,290
1989	21,171	2,313	5,216	9,790	2,352	1,500	19,549	2,138	4,807	9,048	2,174	1,382
1990	22,253	2,295	5,128	10,642	2,428	1,760	19,798	2,049	4,526	9,502	2,168	1,553
1991	26,347	2,392	7,837	11,603	2,595	1,920	22,513	2,050	6,664	9,943	2,224	1,633
1992	26,736	2,338	7,002	12,513	2,843	2,040	22,212	1,947	5,792	10,419	2,367	1,687
1993	27,981	2,662	6,919	13,302	2,938	2,160	22,719	2,164	5,602	10,815	2,389	1,749
1994	28,796	2,505	7,017	14,096	3,008	2,170	22,923	1,998	5,565	11,241	2,399	1,721
1995 (prel.)	29,390	2,500	7,000	14,700	3,000	2,190	22,987	1,958	5,460	11,511	2,349	1,708
1996 (prel.)	29,760	2,500	6,900	15,100	3,000	2,260	22,814	1,920	5,267	11,598	2,304	1,725

1/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = university and college
FFRDC = federally funded research and development center

NOTE: Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994; NSF/SRS, Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995 and 1996.*

Table C-8. National applied research expenditures: 1953-96

Page 1 of 2

Year	United States	Federal Govt. 1/	Industry 2/			Universities & colleges					U&C FFRDCs 6/	Other nonprofit institutions 2/			
				Sources			Sources						Sources		
			Total used	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Industry	U&Cs 5/	Non-profits		Total used	Federal Govt.	Industry	Non-profits 5/
	Millions of current dollars														
1953	1,279	345	726	288	438	130	57	6	57	10	44	34	13	11	10
1954	1,390	349	814	322	492	137	61	7	59	10	51	39	15	13	11
1955	1,481	310	928	368	560	136	58	8	60	10	65	42	17	14	11
1956	1,889	356	1,268	474	794	147	68	9	59	11	71	47	19	14	14
1957	2,374	417	1,670	678	992	145	62	11	61	11	86	56	22	14	20
1958	2,699	474	1,911	774	1,137	148	64	12	61	11	102	64	25	14	25
1959	2,900	558	1,991	813	1,178	155	67	12	64	12	119	77	35	15	27
1960	3,020	595	2,029	833	1,196	179	88	13	66	12	122	95	50	17	28
1961	3,065	634	1,977	812	1,165	192	98	13	69	12	135	127	75	17	35
1962	3,665	702	2,449	1,011	1,438	205	109	13	70	13	155	154	90	19	45
1963	3,742	715	2,457	1,007	1,450	227	128	14	72	13	170	173	105	19	49
1964	4,128	903	2,600	1,040	1,560	232	127	14	77	14	202	191	125	19	47
1965	4,339	990	2,658	1,038	1,620	279	157	13	88	21	204	208	135	21	52
1966	4,601	997	2,843	1,039	1,804	328	194	13	89	32	207	226	145	24	57
1967	4,780	1,027	2,915	1,066	1,849	374	222	15	102	35	219	245	160	25	60
1968	5,130	1,110	3,124	1,043	2,081	403	253	16	97	37	231	262	172	28	62
1969	5,315	1,113	3,287	1,015	2,272	407	246	16	105	40	210	298	200	32	66
1970	5,738	1,345	3,427	1,049	2,378	427	267	16	99	45	216	323	220	33	70
1971	5,759	1,322	3,415	974	2,441	474	292	19	115	48	210	338	230	34	74
1972	6,011	1,387	3,514	952	2,562	524	320	18	140	46	221	365	251	35	79
1973	6,598	1,480	3,825	993	2,832	713	461	23	172	57	227	353	234	36	83
1974	7,189	1,574	4,288	1,025	3,263	736	438	29	203	66	178	413	280	40	93
1975	7,802	1,730	4,570	1,130	3,440	851	515	34	225	77	203	448	300	43	105
1976	8,954	2,093	5,112	1,200	3,912	1,016	584	43	282	107	235	498	330	48	120
1977	9,570	2,044	5,636	1,325	4,311	1,067	607	46	303	111	290	533	345	53	135
1978	10,584	2,191	6,300	1,430	4,870	1,184	644	56	354	130	319	590	385	55	150
1979	11,976	2,392	7,225	1,555	5,670	1,310	708	65	412	125	339	710	480	60	170
1980	13,610	2,484	8,450	1,900	6,550	1,530	878	78	440	134	421	725	480	65	180
1981	16,362	2,732	10,699	2,340	8,359	1,730	946	101	533	150	421	780	515	75	190

See explanatory information and SOURCE at end of table.

Table C-8. National applied research expenditures: 1953-96

Page 2 of 2

Year	United States	Federal Govt. 1/	Industry 2/			Universities & colleges					U&C FFRDCs 6/	Other nonprofit institutions 2/			
			Total used	Sources		Total used 4/	Sources					Total used	Sources		
				Federal Govt.	Industry 3/		Federal Govt.	Industry	U&Cs 5/	Non-profits			Federal Govt.	Industry	Non-profits 5/
	Millions of current dollars														
1982	18,151	2,729	12,323	2,960	9,363	1,858	959	118	608	173	426	815	540	85	190
1983	20,263	3,020	13,927	3,641	10,286	1,989	1,054	126	623	186	452	875	580	95	200
1984	22,386	2,903	15,765	4,224	11,541	2,252	1,190	159	699	204	536	930	600	110	220
1985	25,327	3,133	18,255	5,347	12,908	2,418	1,262	179	756	221	586	935	575	130	230
1986	27,080	3,141	19,760	4,678	15,082	2,628	1,332	215	856	225	561	990	600	140	250
1987	27,687	3,392	19,813	4,660	15,153	2,910	1,455	239	966	250	532	1,040	600	150	290
1988	29,221	3,288	20,748	4,217	16,531	3,516	1,831	279	1,107	299	529	1,140	650	170	320
1989	32,230	3,584	22,691	4,698	17,993	4,055	2,084	327	1,291	353	600	1,300	750	190	360
1990	34,748	3,515	24,785	6,353	18,432	4,344	2,157	371	1,424	392	624	1,480	850	220	410
1991	38,601	4,063	27,446	6,021	21,425	4,478	2,122	387	1,550	419	924	1,690	1,000	240	450
1992	37,805	4,186	26,167	4,983	21,184	4,717	2,338	394	1,551	434	935	1,800	1,050	260	490
1993	37,206	4,790	24,686	4,730	19,956	5,008	2,488	430	1,621	469	962	1,760	1,000	260	500
1994	36,591	4,983	23,491	4,119	19,372	5,230	2,551	455	1,717	507	977	1,910	1,100	270	540
1995 (Prelim.)	37,530	5,000	24,220	4,200	20,000	5,450	2,750	500	1,700	500	950	1,930	1,100	270	560
1996 (Prelim.)	38,750	4,900	25,300	4,300	21,000	5,650	2,850	500	1,800	500	1,000	1,900	1,050	290	560

1/ Total funds used by Federal Government are from Federal sources.

2/ Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

3/ Industry R&D expenditures include all non-Federal sources of funds.

4/ Applied research totals have been estimated since 1978. Distribution by non-Federal sources has been estimated for all years.

5/ Includes R&D funds from State and local government sources.

6/ Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. Data have been estimated since 1978.

KEY:
FFRDC = federally funded research and development centers
U&Cs = university and college

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1995 and 1996. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988-92 were revised and first reported in National Patterns *of R&D Resources:1994*. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; NSF/SRS, *Federal Funds for Research and Development; Fiscal Years 1994, 1995, and 1996.*

Table C-9. Sources of funds for applied research, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1953	1,279	747	455	57	20	5,824	3,405	2,068	260	91
1954	1,390	798	512	59	21	6,272	3,604	2,306	267	95
1955	1,481	818	582	60	21	6,497	3,597	2,542	265	92
1956	1,889	988	817	59	25	8,025	4,204	3,462	252	106
1957	2,374	1,265	1,017	61	31	9,740	5,194	4,168	251	127
1958	2,699	1,439	1,163	61	36	10,839	5,779	4,671	245	145
1959	2,900	1,592	1,205	64	39	11,341	6,230	4,707	251	153
1960	3,020	1,688	1,226	66	40	11,602	6,480	4,715	253	154
1961	3,065	1,754	1,195	69	47	11,654	6,669	4,544	262	179
1962	3,665	2,067	1,470	70	58	13,639	7,697	5,465	261	216
1963	3,742	2,125	1,483	72	62	13,757	7,813	5,452	265	228
1964	4,128	2,397	1,593	77	61	14,920	8,670	5,751	279	220
1965	4,339	2,524	1,654	88	73	15,296	8,904	5,824	311	257
1966	4,601	2,582	1,841	89	89	15,703	8,831	6,262	306	304
1967	4,780	2,694	1,889	102	95	15,811	8,923	6,235	339	314
1968	5,130	2,809	2,125	97	99	16,238	8,930	6,683	311	314
1969	5,315	2,784	2,320	105	106	16,008	8,421	6,947	320	320
1970	5,738	3,097	2,427	99	115	16,399	8,888	6,896	286	329
1971	5,759	3,028	2,494	115	122	15,642	8,270	6,724	317	332
1972	6,011	3,131	2,615	140	125	15,579	8,148	6,740	366	324
1973	6,598	3,395	2,891	172	140	16,136	8,364	7,002	428	343
1974	7,189	3,495	3,332	203	159	16,216	7,964	7,423	469	360
1975	7,802	3,878	3,517	225	182	16,048	8,049	7,151	473	375
1976	8,954	4,442	4,003	282	227	17,258	8,613	7,656	551	438
1977	9,570	4,611	4,410	303	246	17,175	8,296	7,890	547	442
1978	10,584	4,969	4,981	354	280	17,624	8,302	8,261	594	467
1979	11,976	5,474	5,795	412	295	18,342	8,417	8,835	637	452
1980	13,610	6,163	6,693	440	314	19,078	8,678	9,336	623	441
1981	16,362	6,954	8,535	533	340	20,825	8,887	10,819	685	434
1982	18,151	7,614	9,566	608	363	21,674	9,098	11,416	727	434

See explanatory information and SOURCE at end of table.

Table C-9. Sources of funds for applied research, by sector: 1953-96

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Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1983	20,263	8,747	10,507	623	386	23,252	10,043	12,050	716	443
1984	22,386	9,453	11,810	699	424	24,607	10,394	12,978	769	466
1985	25,327	10,903	13,217	756	451	26,836	11,555	14,001	802	478
1986	27,080	10,312	15,437	856	475	27,933	10,631	15,930	882	490
1987	27,687	10,639	15,542	966	540	27,687	10,639	15,542	966	540
1988	29,221	10,515	16,980	1,107	619	28,145	10,136	16,343	1,069	597
1989	32,230	11,716	18,510	1,291	713	29,726	10,814	17,061	1,193	658
1990	34,748	13,499	19,023	1,424	802	30,756	11,979	16,794	1,271	712
1991	38,601	14,130	22,052	1,550	869	32,886	12,062	18,754	1,328	742
1992	37,805	13,492	21,838	1,551	924	31,324	11,201	18,065	1,291	767
1993	37,206	13,970	20,646	1,621	969	30,162	11,339	16,719	1,318	786
1994	36,591	13,730	20,097	1,717	1,047	29,067	10,926	15,939	1,369	833
1995 (prel.)	37,530	14,000	20,770	1,700	1,060	29,309	10,947	16,203	1,331	828
1996 (prel.)	38,750	14,100	21,790	1,800	1,060	29,634	10,804	16,636	1,382	812

1/ Industry sources of industry R&D expenditures include all non-Federal sources of industry R&D performance.

2/ University and college sources of R&D include university and college R&D performance supported by State and local governments.

3/ Nonprofit sources of R&D include nonprofit performance supported by State and local governments.

4/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.*

Table C-10. Applied research performance, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1953	1,279	345	726	130	44	34	5,824	1,575	3,300	594	201	155
1954	1,390	349	814	137	51	39	6,272	1,579	3,667	620	231	176
1955	1,481	310	928	136	65	42	6,497	1,372	4,052	602	288	183
1956	1,889	356	1,268	147	71	47	8,025	1,521	5,373	628	303	199
1957	2,374	417	1,670	145	86	56	9,740	1,716	6,844	597	354	230
1958	2,699	474	1,911	148	102	64	10,839	1,904	7,675	594	410	257
1959	2,900	558	1,991	155	119	77	11,341	2,188	7,777	608	467	301
1960	3,020	595	2,029	179	122	95	11,602	2,280	7,804	686	467	365
1961	3,065	634	1,977	192	135	127	11,654	2,411	7,517	730	513	483
1962	3,665	702	2,449	205	155	154	13,639	2,619	9,104	765	578	572
1963	3,742	715	2,457	227	170	173	13,757	2,629	9,033	835	625	636
1964	4,128	903	2,600	232	202	191	14,920	3,272	9,386	841	732	690
1965	4,339	990	2,658	279	204	208	15,296	3,498	9,359	986	721	732
1966	4,601	997	2,843	328	207	226	15,703	3,426	9,670	1,127	711	769
1967	4,780	1,027	2,915	374	219	245	15,811	3,412	9,620	1,243	728	809
1968	5,130	1,110	3,124	403	231	262	16,238	3,558	9,824	1,292	740	824
1969	5,315	1,113	3,287	407	210	298	16,008	3,393	9,841	1,241	640	892
1970	5,738	1,345	3,427	427	216	323	16,399	3,887	9,736	1,234	624	918
1971	5,759	1,322	3,415	474	210	338	15,642	3,642	9,205	1,306	579	911
1972	6,011	1,387	3,514	524	221	365	15,579	3,631	9,057	1,372	579	941
1973	6,598	1,480	3,825	713	227	353	16,136	3,682	9,262	1,774	565	855
1974	7,189	1,574	4,288	736	178	413	16,216	3,635	9,550	1,700	411	920
1975	7,802	1,730	4,570	851	203	448	16,048	3,634	9,289	1,788	426	911
1976	8,954	2,093	5,112	1,016	235	498	17,258	4,088	9,774	1,984	459	952
1977	9,570	2,044	5,636	1,067	290	533	17,175	3,690	10,082	1,926	523	953
1978	10,584	2,191	6,300	1,184	319	590	17,624	3,676	10,448	1,987	535	978
1979	11,976	2,392	7,225	1,310	339	710	18,342	3,697	11,014	2,025	524	1,082
1980	13,610	2,484	8,450	1,530	421	725	19,078	3,518	11,785	2,167	596	1,011
1981	16,362	2,732	10,699	1,730	421	780	20,825	3,512	13,560	2,224	541	989
1982	18,151	2,729	12,323	1,858	426	815	21,674	3,264	14,705	2,222	510	973

See explanatory information and SOURCE at end of table.

Table C-10. Applied research performance, by sector: 1953-96

Page 2 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1983	20,263	3,020	13,927	1,989	452	875	23,252	3,471	15,971	2,286	520	1,003
1984	22,386	2,903	15,765	2,252	536	930	24,607	3,194	17,324	2,477	590	1,022
1985	25,327	3,133	18,255	2,418	586	935	26,836	3,322	19,338	2,564	621	990
1986	27,080	3,141	19,760	2,628	561	990	27,933	3,235	20,392	2,706	578	1,022
1987	27,687	3,392	19,813	2,910	532	1,040	27,687	3,392	19,813	2,910	532	1,040
1988	29,221	3,288	20,748	3,516	529	1,140	28,145	3,174	19,969	3,394	511	1,097
1989	32,230	3,584	22,691	4,055	600	1,300	29,726	3,312	20,913	3,748	555	1,198
1990	34,748	3,515	24,785	4,344	624	1,480	30,756	3,138	21,876	3,879	557	1,306
1991	38,601	4,063	27,446	4,478	924	1,690	32,886	3,482	23,338	3,837	792	1,437
1992	37,805	4,186	26,167	4,717	935	1,800	31,324	3,485	21,644	3,928	779	1,489
1993	37,206	4,790	24,686	5,008	962	1,760	30,162	3,894	19,989	4,072	782	1,425
1994	36,591	4,983	23,491	5,230	977	1,910	29,067	3,974	18,629	4,171	779	1,515
1995 (prel.)	37,530	5,000	24,200	5,450	950	1,930	29,309	3,915	18,877	4,268	744	1,505
1996 (prel.)	38,750	4,900	25,300	5,650	1,000	1,900	29,634	3,763	19,313	4,339	768	1,450

1/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: FFRDC = federally funded research and development center
U&C = university and college

NOTE: Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994;* NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.*

Table C-11. National development expenditures: 1953-96

Page 1 of 2

Year	United States	Federal Govt. 1/	Industry 2/			Universities & colleges					U&C FFRDCs 6/	Other nonprofit institutions 2/			
				Sources			Sources						Sources		
			Total used	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Industry	U&Cs 5/	Non-profits		Total used	Federal Govt.	Industry	Non-profits
	Millions of current dollars														
1953	3,404	564	2,753	1,123	1,630	15	8	1	5	1	44	28	16	6	6
1954	3,758	569	3,090	1,405	1,685	17	9	1	6	1	51	31	17	7	7
1955	4,144	505	3,523	1,785	1,738	17	8	1	7	1	66	33	18	8	7
1956	5,795	580	5,084	2,817	2,267	25	15	2	7	1	72	34	19	8	7
1957	6,621	681	5,790	3,616	2,174	25	12	2	9	2	89	36	20	8	8
1958	7,135	774	6,183	3,942	2,241	27	12	3	10	2	113	38	21	8	9
1959	8,418	909	7,307	4,750	2,557	28	13	3	10	2	127	47	28	9	10
1960	9,306	971	8,104	5,169	2,935	34	18	3	11	2	141	56	36	10	10
1961	9,850	1,034	8,536	5,347	3,189	35	20	2	11	2	160	85	61	10	14
1962	10,005	1,145	8,527	5,281	3,246	40	23	2	13	2	179	114	85	11	18
1963	11,352	1,309	9,651	6,116	3,535	40	22	2	14	2	201	151	120	11	20
1964	12,437	1,621	10,363	6,515	3,848	40	22	2	14	2	236	177	148	11	18
1965	13,150	1,739	10,935	6,516	4,419	57	37	2	15	3	217	202	170	12	20
1966	14,431	1,838	12,081	7,120	4,961	84	59	2	18	5	196	232	195	14	23
1967	15,310	1,934	12,841	7,097	5,744	90	63	2	20	5	204	241	202	15	24
1968	16,178	1,952	13,663	7,337	6,326	96	68	3	17	8	212	255	213	16	26
1969	16,873	1,856	14,403	7,276	7,127	107	75	5	17	10	240	267	221	18	28
1970	16,865	2,175	14,038	6,572	7,466	112	84	5	13	10	252	288	240	18	30
1971	17,265	2,340	14,315	6,558	7,757	112	83	5	14	10	246	252	200	19	33
1972	18,664	2,605	15,445	6,935	8,510	84	55	3	19	7	288	242	188	19	35
1973	20,175	2,674	16,793	7,020	9,773	118	70	4	33	11	294	296	238	20	38
1974	21,331	2,641	17,900	7,032	10,868	133	71	6	42	14	297	360	297	21	42
1975	22,673	2,890	18,887	7,318	11,569	148	78	7	47	16	345	403	330	22	51
1976	24,934	2,890	21,066	8,176	12,890	164	87	9	52	16	400	414	330	23	61
1977	27,478	3,054	23,278	8,950	14,328	200	112	14	58	16	494	452	352	27	73
1978	30,895	3,590	25,969	9,509	16,460	308	194	15	78	21	531	497	380	30	87
1979	35,395	3,937	29,843	10,698	19,145	437	313	14	84	26	574	604	470	35	99
1980	40,551	3,966	34,730	11,839	22,891	497	359	17	93	28	693	665	520	40	105
1981	45,902	4,392	39,497	13,741	25,756	523	365	20	108	30	795	695	540	45	110
1982	51,427	4,947	44,423	15,204	29,219	586	407	24	121	34	726	745	575	50	120

See explanatory information and SOURCE at end of table.

Table C-11. National development expenditures: 1953-96

			Industry 2/			Universities & colleges						Other nonprofit institutions 2/			
				Sources			Sources						Sources		
Year	United States	Federal Govt. 1/	Total used	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Industry	U&Cs 5/	Non-profits	U&C FFRDCs 6/	Total used	Federal Govt.	Industry	Non-profits
	Millions of current dollars														
1983	57,236	5,872	49,118	16,576	32,542	590	388	27	135	40	801	855	670	55	130
1984	65,848	6,808	56,427	18,696	37,731	634	411	33	147	43	924	1,055	850	65	140
1985	74,281	7,889	63,122	21,360	41,762	713	459	39	166	49	1,172	1,385	1,150	75	160
1986	75,862	8,375	64,016	22,662	41,354	808	513	49	195	51	1,458	1,205	950	85	170
1987	79,664	7,975	68,019	25,352	42,667	849	513	55	223	58	1,641	1,180	900	90	190
1988	84,472	8,776	71,767	25,133	46,634	1,052	684	61	242	65	1,757	1,120	800	100	220
1989	87,435	9,128	74,148	22,472	51,676	1,131	712	70	274	75	1,778	1,250	900	110	240
1990	94,391	10,039	79,814	20,404	59,410	1,298	833	79	303	83	1,780	1,460	1,050	130	280
1991	95,050	8,684	81,669	18,639	63,030	1,498	985	84	338	91	1,559	1,640	1,200	140	300
1992	99,857	9,060	85,940	18,555	67,385	1,578	1,037	90	352	99	1,469	1,810	1,350	140	320
1993	99,863	9,212	85,796	17,118	68,678	1,630	1,071	95	360	104	1,395	1,830	1,350	140	340
1994	102,700	8,651	89,088	17,405	71,683	1,755	1,165	100	380	110	1,286	1,920	1,400	160	360
1995 (prelim.)	111,630	8,900	97,500	18,500	79,000	1,750	1,150	100	400	100	1,450	2,030	1,500	160	370
1996 (prelim.)	115,790	8,800	102,000	18,000	84,000	1,650	1,050	100	400	100	1,400	1,940	1,400	170	370

1/ Total funds used by Federal Government are from Federal sources.

2/ Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

3/ Industry R&D expenditures include all non-Federal sources of funds.

4/ Development totals have been estimated since 1978. Distribution by non-Federal sources has been estimated for all years.

5/ Includes R&D funds from State and local government sources.

6/ Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. Data have been estimated since 1978.

KEY: FFRDC = federally funded research and development center
U&C = university and college

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1995 and 1996. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988-92 were revised and first reported in *National Patterns of R&D Resources: 1994*. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994;* NSF/SRS, *Federal Funds for Research and Development; Fiscal Years 1994, 1995, and 1996.*

Table C-12. Sources of funds for development, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1953	3,404	1,755	1,637	5	7	15,486	7,990	7,441	23	32
1954	3,758	2,051	1,693	6	8	16,941	9,252	7,626	27	36
1955	4,144	2,382	1,747	7	8	18,130	10,435	7,629	31	35
1956	5,795	3,503	2,277	7	8	24,580	14,867	9,648	30	34
1957	6,621	4,418	2,184	9	10	27,149	18,120	8,951	37	41
1958	7,135	4,862	2,252	10	11	28,655	19,526	9,044	40	44
1959	8,418	5,827	2,569	10	12	32,899	22,778	10,035	39	47
1960	9,306	6,335	2,948	11	12	35,775	24,349	11,338	42	46
1961	9,850	6,622	3,201	11	16	37,452	25,179	12,171	42	61
1962	10,005	6,713	3,259	13	20	37,212	24,974	12,115	49	74
1963	11,352	7,768	3,548	14	22	41,735	28,559	13,044	51	81
1964	12,437	8,542	3,861	14	20	44,924	30,862	13,939	51	72
1965	13,150	8,679	4,433	15	23	46,328	30,585	15,609	53	81
1966	14,431	9,408	4,977	18	28	49,159	32,073	16,929	62	95
1967	15,310	9,500	5,761	20	29	50,577	31,401	19,013	66	96
1968	16,178	9,782	6,345	17	34	51,011	30,896	19,953	54	107
1969	16,873	9,668	7,150	17	38	50,639	29,065	21,407	52	114
1970	16,865	9,323	7,489	13	40	48,037	26,609	21,276	38	114
1971	17,265	9,427	7,781	14	43	46,697	25,568	20,973	39	116
1972	18,664	10,071	8,532	19	42	48,224	26,076	21,990	50	109
1973	20,175	10,296	9,797	33	49	49,054	25,131	23,722	82	119
1974	21,331	10,338	10,895	42	56	47,761	23,272	24,266	97	126
1975	22,673	10,961	11,598	47	67	46,314	22,505	23,574	99	137
1976	24,934	11,883	12,922	52	77	47,817	22,860	24,708	102	148
1977	27,478	12,962	14,369	58	89	49,216	23,247	25,705	105	159
1978	30,895	14,204	16,505	78	108	51,322	23,640	27,372	131	180
1979	35,395	15,992	19,194	84	125	54,061	24,480	29,259	130	191
1980	40,551	17,377	22,948	93	133	56,669	24,345	32,006	132	186
1981	45,902	19,832	25,821	109	140	58,280	25,235	32,727	140	178
1982	51,427	21,859	29,293	121	154	61,387	26,102	34,956	145	184

See explanatory information and SOURCE at end of table.

Table C-12. Sources of funds for development, by sector: 1953-96

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Year	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/	United States	Federal Govt.	Industry 1/	Universities & colleges 2/	Non-profits 3/
	Millions of current dollars					Millions of constant 1987 dollars 4/				
1983	57,236	24,307	32,624	135	170	65,657	27,894	37,413	155	195
1984	65,848	27,689	37,829	147	183	72,371	30,437	41,570	162	201
1985	74,281	32,030	41,876	166	209	78,698	33,941	44,360	176	221
1986	75,862	33,958	41,488	195	221	78,266	35,022	42,815	201	228
1987	79,664	36,381	42,812	223	248	79,664	36,381	42,812	223	248
1988	84,472	37,150	46,795	242	285	81,334	35,787	45,039	234	274
1989	87,435	34,990	51,856	274	315	80,616	32,279	47,794	253	291
1990	94,391	34,106	59,619	303	363	83,445	30,232	52,621	271	321
1991	95,050	31,067	63,254	338	391	80,902	26,491	53,788	290	333
1992	99,857	31,471	67,615	352	419	82,661	26,094	55,927	293	347
1993	99,863	30,146	68,913	360	444	80,901	24,448	55,800	293	360
1994	102,700	29,907	71,943	380	470	81,495	23,766	57,053	303	373
1995 (preliminary)	111,630	31,500	79,260	400	470	87,112	24,606	61,826	313	367
1996 (preliminary)	115,790	30,650	84,270	400	470	88,445	23,450	64,329	307	359

1/ Industry sources of industry R&D expenditures include all non-Federal sources of industry R&D performance.

2/ University and college sources of R&D include university and college R&D performance supported by State and local governments.

3/ Nonprofit sources of R&D include nonprofit performance supported by State and local governments.

4/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTES: Data are preliminary for 1995 and 1996. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*, and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.*

Table C-13. Development performance, by sector: 1953-96

Page 1 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1953	3,404	564	2,753	15	44	28	15,486	2,575	12,514	68	201	127
1954	3,758	569	3,090	17	51	31	16,941	2,575	13,919	77	231	140
1955	4,144	505	3,523	17	66	33	18,130	2,235	15,384	75	292	144
1956	5,795	580	5,084	25	72	34	24,580	2,479	21,542	107	308	144
1957	6,621	681	5,790	25	89	36	27,149	2,802	23,730	103	366	148
1958	7,135	774	6,183	27	113	38	28,655	3,108	24,831	108	454	153
1959	8,418	909	7,307	28	127	47	32,899	3,565	28,543	110	498	184
1960	9,306	971	8,104	34	141	56	35,775	3,720	31,169	130	540	215
1961	9,850	1,034	8,536	35	160	85	37,452	3,932	32,456	133	608	323
1962	10,005	1,145	8,527	40	179	114	37,212	4,272	31,699	149	668	424
1963	11,352	1,309	9,651	40	201	151	41,735	4,813	35,482	147	739	555
1964	12,437	1,621	10,363	40	236	177	44,924	5,873	37,412	145	855	639
1965	13,150	1,739	10,935	57	217	202	46,328	6,145	38,504	201	767	711
1966	14,431	1,838	12,081	84	196	232	49,159	6,316	41,092	289	674	789
1967	15,310	1,934	12,841	90	204	241	50,577	6,425	42,380	299	678	795
1968	16,178	1,952	13,663	96	212	255	51,011	6,256	42,965	308	679	802
1969	16,873	1,856	14,403	107	240	267	50,639	5,659	43,123	326	732	799
1970	16,865	2,175	14,038	112	252	288	48,037	6,286	39,881	324	728	818
1971	17,265	2,340	14,315	112	246	252	46,697	6,446	38,585	309	678	679
1972	18,664	2,605	15,445	84	288	242	48,224	6,819	39,807	220	754	624
1973	20,175	2,674	16,793	118	294	296	49,054	6,652	40,661	294	731	717
1974	21,331	2,641	17,900	133	297	360	47,761	6,099	39,866	307	686	802
1975	22,673	2,890	18,887	148	345	403	46,314	6,071	38,388	311	725	819
1976	24,934	2,890	21,066	164	400	414	47,817	5,645	40,279	320	781	792
1977	27,478	3,054	23,278	200	494	452	49,216	5,513	41,642	361	892	809
1978	30,895	3,590	25,969	308	531	497	51,322	6,023	43,066	517	891	824
1979	35,395	3,937	29,843	437	574	604	54,061	6,085	45,492	675	887	921
1980	40,551	3,966	34,730	497	693	665	56,669	5,618	48,438	704	982	927
1981	45,902	4,392	39,497	523	795	695	58,280	5,645	50,060	672	1,022	881
1982	51,427	4,947	44,423	586	726	745	61,387	5,917	53,011	701	868	889

See explanatory information and SOURCE at end of table.

Table C-13. Development performance, by sector: 1953-96

Page 2 of 2

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars 1/					
1983	57,236	5,872	49,118	590	801	855	65,657	6,749	56,328	678	921	981
1984	65,848	6,808	56,427	634	924	1,055	72,371	7,490	62,008	697	1,017	1,159
1985	74,281	7,889	63,122	713	1,172	1,385	78,698	8,366	66,867	756	1,243	1,467
1986	75,862	8,375	64,016	808	1,458	1,205	78,266	8,625	66,064	832	1,502	1,244
1987	79,664	7,975	68,019	849	1,641	1,180	79,664	7,975	68,019	849	1,641	1,180
1988	84,472	8,776	71,767	1,052	1,757	1,120	81,334	8,471	69,073	1,015	1,696	1,078
1989	87,435	9,128	74,148	1,131	1,778	1,250	80,616	8,436	68,339	1,045	1,643	1,152
1990	94,391	10,039	79,814	1,298	1,780	1,460	83,445	8,963	70,445	1,159	1,589	1,289
1991	95,050	8,684	81,669	1,498	1,559	1,640	80,902	7,441	69,446	1,284	1,336	1,395
1992	99,857	9,060	85,940	1,578	1,469	1,810	82,661	7,544	71,084	1,314	1,223	1,497
1993	99,863	9,212	85,796	1,630	1,395	1,830	80,901	7,489	69,470	1,325	1,134	1,482
1994	102,700	8,651	89,088	1,755	1,286	1,920	81,495	6,899	70,649	1,400	1,026	1,523
1995 (prel.)	111,630	8,900	97,500	1,750	1,450	2,030	87,112	6,969	76,053	1,370	1,135	1,583
1996 (prel.)	115,790	8,800	102,000	1,650	1,400	1,940	88,445	6,759	77,863	1,267	1,075	1,481

1/ See table C-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = university and college
FFRDC = federally funded research and development center

NOTES: Data are preliminary for 1995 and 1996. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1994*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.*

Table C-14. Trends in Federal and non-Federal R&D expenditures: 1953-96

Page 1 of 2

Year	Federal				Non-Federal
	Total Federal	Defense related	Space related	Civilian related	
	Percent				
1953	53.7	48.0	1.0	4.7	46.3
1954	55.5	49.0	1.0	5.5	44.5
1955	56.7	48.2	1.0	7.6	43.3
1956	58.0	49.2	1.0	7.8	42.0
1957	62.5	52.9	0.9	8.7	37.5
1958	63.3	52.6	1.1	9.6	36.7
1959	65.1	54.0	2.5	8.5	34.9
1960	64.6	52.2	3.2	9.2	35.4
1961	64.6	50.0	5.5	9.1	35.4
1962	64.4	48.8	6.6	9.1	35.6
1963	65.7	41.4	13.5	10.9	34.3
1964	66.5	36.8	18.9	10.8	33.5
1965	64.9	33.1	20.8	11.1	35.1
1966	63.9	32.3	19.5	12.1	36.1
1967	62.2	35.2	14.3	12.7	37.8
1968	60.7	34.7	13.6	12.4	39.3
1969	58.1	34.4	11.4	12.3	41.9
1970	57.0	33.3	10.3	13.3	43.0
1971	56.1	32.5	9.5	14.0	43.9
1972	55.5	32.8	7.9	14.9	44.5
1973	53.4	31.9	6.7	14.8	46.6
1974	51.3	28.9	6.9	15.5	48.7
1975	51.4	27.4	7.4	16.6	48.6
1976	51.0	26.7	7.6	16.7	49.0
1977	50.5	26.9	6.6	17.0	49.5
1978	49.6	25.7	6.2	17.8	50.4
1979	48.8	24.6	5.5	18.6	51.2
1980	47.1	24.1	5.3	17.7	52.9
1981	46.5	24.3	5.2	17.0	53.5
1982	45.7	25.9	4.9	14.9	54.3
1983	45.8	27.5	4.2	14.1	54.2
1984	45.1	28.5	3.0	13.7	54.9
1985	45.8	29.8	3.1	12.9	54.2
1986	45.4	31.5	3.0	10.9	54.6
1987	46.2	31.7	3.1	11.4	53.8
1988	44.7	30.4	3.4	11.0	55.3
1989	42.5	27.8	3.7	10.9	57.5
1990	40.5	25.4	4.2	11.0	59.5
1991	37.6	22.4	4.5	10.7	62.4
1992	36.6	21.4	4.3	10.9	63.4

See explanatory information and SOURCE at end of table.

Table C-14. Trends in Federal and non-Federal R&D expenditures: 1953-96

Page 2 of 2

Year	Federal				Non-Federal
	Total Federal	Defense related	Space related	Civilian related	
	Percent				
1993	36.5	21.6	4.4	10.6	63.5
1994	35.8	19.8	4.4	11.6	64.2
1995 (preliminary)	35.0	19.2	4.3	11.6	65.0
1996 (preliminary)	33.6	17.9	4.0	11.7	66.4

NOTES: Data are preliminary for 1995 and 1996. Details may not sum to totals because of rounding.

SOURCE: National Science Foundation/SRS

Table C-15. National expenditures for R&D as a percentage of gross domestic product, by souce of funds: 1953-96

Page 1 of 2

Year	Total R&D/GDP	Federal R&D/GDP	Non-Federal R&D/GDP
1953	1.38	0.74	0.64
1954	1.52	0.84	0.68
1955	1.53	0.87	0.66
1956	1.96	1.14	0.82
1957	2.18	1.36	0.82
1958	2.36	1.49	0.86
1959	2.50	1.63	0.87
1960	2.63	1.70	0.93
1961	2.69	1.74	0.95
1962	2.69	1.73	0.96
1963	2.83	1.86	0.97
1964	2.91	1.93	0.97
1965	2.85	1.85	1.00
1966	2.84	1.81	1.02
1967	2.84	1.77	1.07
1968	2.77	1.68	1.09
1969	2.67	1.55	1.12
1970	2.59	1.47	1.11
1971	2.43	1.36	1.07
1972	2.36	1.31	1.05
1973	2.28	1.22	1.06
1974	2.25	1.16	1.10
1975	2.22	1.14	1.08
1976	2.21	1.13	1.08
1977	2.17	1.09	1.07
1978	2.16	1.07	1.09
1979	2.21	1.08	1.13
1980	2.31	1.09	1.22
1981	2.37	1.10	1.27
1982	2.54	1.16	1.38
1983	2.62	1.20	1.42
1984	2.68	1.21	1.47
1985	2.82	1.29	1.53
1986	2.80	1.27	1.53
1987	2.76	1.28	1.49
1988	2.71	1.21	1.50
1989	2.68	1.14	1.54
1990	2.73	1.11	1.62
1991	2.79	1.05	1.74
1992	2.73	1.00	1.73

See explanatory information and SOURCE at end of table.

Table C-15. National expenditures for R&D as a percentage of gross domestic product, by souce of funds: 1953-96

Page 2 of 2

Year	Total R&D/GDP	Federal R&D/GDP	Non-Federal R&D/GDP
1993	2.60	0.95	1.65
1994	2.49	0.89	1.60
1995 (preliminary)	2.52	0.88	1.64
1996 (preliminary)	2.48	0.88	1.65

NOTE: Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS and U.S. Department of Commerce.

Table C-16. Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1993

Page 1 of 3

Geographic area	United States	Federal Govt. 1/	Industry			Universities & colleges						U&C FFRDCs 5/	Non-profits 6/
				Sources			Sources						
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Non-Fed. govt.	Industry	U&C	All other		
	Millions of current dollars												
Total, U.S.	165,048	16,663	117,400	22,809	94,388	19,940	11,956	1,559	1,361	3,578	1,486	5,295	5,750
New England	13,674	730	10,092	2,311	7,781	1,736	1,172	39	133	214	178	355	761
Connecticut	2,809	53	2,373	419	1,954	365	221	10	18	81	35	0	18
Maine	114	13	59	D	D	25	9	2	4	10	0	0	17
Massachusetts	9,486	384	6,952	1,878	5,074	1,094	772	15	98	80	128	355	701
New Hampshire	438	89	248	D	D	99	68	6	5	12	9	0	2
Rhode Island	484	185	176	12	164	103	72	3	3	23	2	0	20
Vermont	343	6	284	D	D	50	32	3	5	8	3	0	3
Middle Atlantic	28,434	994	23,693	2,912	20,781	2,938	1,896	132	225	446	238	445	364
New Jersey	9,181	509	8,162	378	7,784	374	167	36	26	116	28	116	20
New York	10,974	131	8,820	1,392	7,428	1,545	1,052	76	88	180	149	293	185
Pennsylvania	8,278	354	6,711	1,142	5,569	1,019	677	20	112	149	61	35	159
South Atlantic	22,994	8,034	10,692	3,078	7,614	3,605	2,224	307	281	643	166	63	600
Delaware	1,247	12	1,181	24	1,157	53	26	4	5	14	4	0	1
D.C.	2,543	1,713	540	21	519	145	100	1	10	18	15	0	145
Florida	3,526	608	2,425	970	1,455	489	268	32	41	120	29	0	4
Georgia	1,577	159	860	63	797	547	273	39	52	168	15	0	11
Maryland	7,423	4,010	2,076	1,287	789	1,128	842	90	48	116	32	0	209
North Carolina	2,745	174	1,929	16	1,913	605	378	74	70	64	19	0	37
South Carolina	713	38	495	D	D	178	73	16	14	53	22	0	2
Virginia	2,941	1,227	1,087	595	492	405	228	46	36	69	26	35	187
West Virginia	280	93	100	D	D	55	32	2	4	14	3	28	4
Southeast	3,935	1,099	1,966	865	1,101	787	452	86	63	134	51	11	72
Alabama	1,967	833	833	406	427	281	161	27	24	48	21	0	20
Kentucky	429	16	289	7	282	122	56	6	14	41	6	0	2
Mississippi	325	163	52	D	D	106	55	22	10	11	8	0	4
Tennessee	1,214	87	792	D	D	278	180	31	16	34	16	11	46

See explanatory information and SOURCE at end of table.

Table C-16 Geographic distribution of U S R&D expenditures by performer and source of funds 1993

Page 2 of 3

Geographic area	United States	Federal Govt. 1/	Industry			Universities & colleges						U&C FFRDCs 5/	Non-profits 6/
				Sources			Sources						
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Non-Fed. govt.	Industry	U&C	All other		
	Millions of current dollars												
Southwest	8,269	586	5,547	658	4,889	1,889	861	268	123	436	201	5	242
Arkansas	301	41	185	D	D	74	25	24	7	15	3	0	1
Louisiana	470	43	170	D	D	255	96	64	17	61	17	0	2
Oklahoma	533	34	311	2	309	173	56	22	10	67	16	0	15
Texas	6,966	468	4,882	640	4,242	1,387	683	158	90	293	164	5	224
Great Lakes	28,364	877	23,830	1,642	22,188	2,798	1,573	220	181	559	264	649	210
Illinois	6,778	83	5,242	236	5,006	758	425	46	45	178	64	649	46
Indiana	2,560	77	2,177	D	D	303	168	21	23	66	26	0	3
Michigan	10,778	96	9,924	153	9,771	700	377	40	47	172	64	0	58
Ohio	6,398	583	5,144	1,030	4,114	594	348	46	48	89	62	0	77
Wisconsin	1,851	38	1,343	D	D	444	255	68	19	54	48	0	26
Plains	6,519	198	4,816	816	4,000	1,342	643	194	90	331	84	37	126
Iowa	902	30	533	D	D	299	145	38	18	81	17	37	3
Kansas	463	12	292	47	245	154	60	37	8	44	6	0	5
Minnesota	2,922	40	2,458	378	2,080	332	175	50	22	65	21	0	92
Missouri	1,789	51	1,375	D	D	345	191	19	31	78	25	0	18
Nebraska	295	25	128	14	114	136	38	40	9	36	13	0	6
North Dakota	91	27	9	D	D	54	25	2	2	24	2	0	1
South Dakota	58	13	22	D	D	22	9	10	1	2	1	0	1
Mountain	8,820	1,161	5,013	1,651	3,362	1,233	718	81	89	273	72	1,223	189
Arizona	1,608	206	1,042	298	744	311	150	6	19	113	23	40	9
Colorado	2,864	170	2,111	252	1,859	331	222	18	24	42	26	99	153
Idaho	477	37	391	D	D	49	17	13	7	11	1	0	0
Montana	85	22	14	D	D	48	21	9	3	14	0	0	1
Nevada	218	71	67	D	D	79	43	4	5	25	1	0	1
New Mexico	2,752	504	962	D	D	187	113	14	19	29	12	1,084	15
Utah	753	141	411	51	360	196	137	13	9	29	8	0	5
Wyoming	63	10	15	D	D	33	15	4	2	11	1	0	5

See explanatory information and SOURCE at end of table.

Table C-16. Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1993

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Geographic area	United States	Federal Govt. 1/	Industry			Universities & colleges						U&C FFRDCs 5/	Non-profits 6/
				Sources			Sources						
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Non-Fed. govt.	Industry	U&C	All other		
						Millions of current dollars							
Pacific	40,427	2,039	31,971	8,393	23,578	3,174	2,160	186	146	475	207	2,499	744
Alaska	130	48	14	D	D	67	42	3	5	17	0	0	1
California	33,721	1,785	26,541	7,463	19,078	2,380	1,630	112	99	368	171	2,499	516
Hawaii	380	42	255	D	D	74	41	27	0	3	2	0	9
Oregon	774	51	471	32	439	226	135	30	9	34	18	0	26
Washington	5,422	113	4,689	891	3,798	428	312	14	34	52	16	0	192
Other/unknown7	3,612	945	-220	483	-906	437	257	45	30	67	24	8	2,442

1/ Total funds used by the Federal Government are from Federal sources.

2/ Industry totals include R&D performed by industry-administered FFRDCs. Totals for the following States are more than 50 percent imputed: Delaware, D.C., Kansas, Louisiana, Missouri, Washington, and West Virginia. Totals for the following States were based entirely on estimates by NSF: Maine, Montana, New Mexico, and Vermont.

3/ Industry R&D support to industry performers include all nonfederal sources of funds.

4/ For universities and colleges, funds distributed by State and region are for doctorate-granting institutions only.

5/ Includes R&D expenditures of university-associated FFRDCs, of which 99 percent were from federal sources.

6/ For the nonprofit sector, funds distributed by state and region include only federal obligations to organizations in this sector, including associated FFRDCs. Estimated nonfederal support to the nonprofit sector is included in "other/unknown."

7/ Negative figures for industry reflect revisions in industry aggregate R&D totals that could not be allocated to individual states.

KEY: D = withheld to avoid disclosing operations of individual companies
FFRDC = federally funded research and development center
U&C = university and college

NOTE: Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1993*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994, and 1995*.

Table C-17. Total R&D and GSP by state: 1993

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Rank in total R&D	State	Millions of current dollars		Percent R&D/GSP	Rank in R&D/GSP	Percent of US R&D	Cummulative percent of US R&D
		Total R&D	GSP 1/				
	Total, U.S.	165,048	6,163,552	2.7	--	100.0	100.0
1	California	33,721	786,408	4.3	7	20.4	20.4
2	New York	10,974	504,037	2.2	19	6.6	27.1
3	Michigan	10,778	213,354	5.1	5	6.5	33.6
4	Massachusetts	9,486	167,140	5.7	4	5.7	39.4
5	New Jersey	9,181	229,104	4.0	9	5.6	44.9
6	Pennsylvania	8,278	273,046	3.0	11	5.0	49.9
7	Maryland	7,423	120,020	6.2	2	4.5	54.4
8	Texas	6,966	430,973	1.6	28	4.2	58.7
9	Illinois	6,778	303,341	2.2	17	4.1	62.8
10	Ohio	6,398	249,133	2.6	15	3.9	66.6
11	Washington	5,422	129,569	4.2	8	3.3	69.9
12	Florida	3,526	282,481	1.2	31	2.1	72.1
13	Virginia	2,941	160,411	1.8	24	1.8	73.8
14	Minnesota	2,922	111,351	2.6	14	1.8	75.6
15	Colorado	2,864	88,632	3.2	10	1.7	77.3
16	Connecticut	2,809	100,316	2.8	13	1.7	79.0
17	New Mexico	2,752	33,791	8.1	1	1.7	80.7
18	North Carolina	2,745	169,153	1.6	27	1.7	82.4
19	Indiana	2,560	126,443	2.0	22	1.6	83.9
20	D.C.	2,543	41,590	6.1	3	1.5	85.5
21	Alabama	1,967	80,775	2.4	16	1.2	86.7
22	Wisconsin	1,851	113,142	1.6	26	1.1	87.8
23	Missouri	1,789	114,458	1.6	29	1.1	88.9
24	Arizona	1,608	78,153	2.1	21	1.0	89.8
25	Georgia	1,577	162,110	1.0	36	1.0	90.8
26	Delaware	1,247	25,555	4.9	6	0.8	91.6
27	Tennessee	1,214	114,257	1.1	34	0.7	92.3
28	Iowa	902	58,702	1.5	30	0.5	92.8
29	Oregon	774	66,354	1.2	32	0.5	93.3
30	Utah	753	37,607	2.0	23	0.5	93.8
31	South Carolina	713	72,771	1.0	35	0.4	94.2
32	Oklahoma	533	61,482	0.9	38	0.3	94.5
33	Rhode Island	484	22,116	2.2	18	0.3	94.8
34	Idaho	477	22,916	2.1	20	0.3	95.1
35	Louisiana	470	95,219	0.5	48	0.3	95.4
36	Kansas	463	56,832	0.8	39	0.3	95.7
37	New Hampshire	438	26,312	1.7	25	0.3	95.9
38	Kentucky	429	78,044	0.5	44	0.3	96.2
39	Hawaii	380	34,078	1.1	33	0.2	96.4
40	Vermont	343	12,210	2.8	12	0.2	96.6

See explanatory information and SOURCE at end of table.

Table C-17. Total R&D and GSP by state: 1993

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Rank in total R&D	State	Millions of current dollars		Percent R&D/GSP	Rank in R&D/GSP	Percent of US R&D	Cummulative percent of US R&D
		Total R&D	GSP 1/				
41	Mississippi	325	46,171	0.7	42	0.2	96.8
42	Arkansas	301	44,726	0.7	43	0.2	97.0
43	Nebraska	295	38,226	0.8	40	0.2	97.2
44	West Virginia	280	31,550	0.9	37	0.2	97.4
45	Nevada	218	39,683	0.5	45	0.1	97.5
46	Alaska	130	25,716	0.5	47	0.1	97.6
47	Maine	114	24,710	0.5	50	0.1	97.6
48	North Dakota	91	12,478	0.7	41	0.1	97.7
49	Montana	85	16,756	0.5	46	0.1	97.7
50	Wyoming	63	13,569	0.5	49	0.0	97.8
51	South Dakota	58	15,981	0.4	51	0.0	97.8
	Other/unknown	3,612					100.0

1/ The Bureau of Economic Analysis has prepared GSP data through 1992. GSP data for 1993 were estimated here based on measures of annual, state-wide, rates of change in employee compensation and proprietors' income.

KEY: GSP = gross state product

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1993*; NSF/SRS, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development; Fiscal Years 1993, 1994, and 1995*; and Department of Commerce, Bureau of Economic Analysis.

Table C-18. Scientists and engineers primarily engaged in research and development activities, by sector of employment: 1985-93

In Thousands

Page 1 of 1

	1985	1986	1987	1988	1989	1990	1991	1992	1993
United States R&D S&Es, total	801.9	NA	877.8	NA	924.2	NA	960.4	NA	962.7
Total, all industries 1/	646.8	683.4	702.2	715.6	733.1	758.5	776.4	772.0	764.5
Food and tobacco products (20,21)	(S)	(S)	(S)	(S)	(S)	(S)	9.6	9.7	9.9
Petroleum refining and extraction (13,29)	12.0	10.2	9.7	10.1	10.9	11.3	11.5	11.3	10.6
Chemicals and allied products (28)	73.5	75.5	75.5	77.1	79.4	81.0	83.6	86.1	90.7
Machinery (35)	85.7	92.8	97.1	99.4	106.9	111.5	104.5	98.4	83.3
Electrical equipment (36)	115.6	124.2	131.5	127.5	113.9	100.6	93.9	90.6	90.8
Transportation equipment (37)	169.8	183.3	187.8	186.8	177.8	160.0	145.4	144.3	136.7
Professional and scientific instruments (38)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Nonmanufacturing industries	71.0	85.8	99.2	(S)	(S)	(S)	(S)	199.6	193.7
All other industries	119.4	111.9	101.6	214.7	244.3	294.3	327.9	132.3	149.0
Federal Government, total 2/	52.1	51.6	54.3	54.2	58.8	59.4	58.3	61.8	60.0
Research	22.3	21.2	22.4	22.4	24.6	24.7	25.2	25.8	25.1
Development	29.7	30.4	31.9	31.7	34.2	34.6	33.1	36.0	34.9
Educational institutions, total 3/	95.2	NA	112.4	NA	123.1	NA	117.1	NA	128.0
Basic research	43.6		48.4		52.7		46.3		49.5
Applied research	15.7		24.1		26.0		23.3		31.0
Development/design	1.4		0.8		0.9		1.1		2.7
Management/administration of R&D	4.0		3.9		3.9		3.9		0.0 6/
Nonprofit organizations, total 3/	7.8	NA	8.9	NA	9.2	NA	8.7	NA	10.2
Basic research	3.4		3.4		3.8		3.2		3.6
Applied reserach	2.2		3.4		3.2		3.2		5.3
Development/design	0.5		0.4		0.5		0.6		1.2
Management/administration of R&D	1.7		1.7		1.7		1.7		0.0 6/
Science and engineering graduate students 4/	30.5	33.0	35.1	37.3	39.5	40.3	42.5	43.8	44.9
Total United States labor force 5/	117,167	119,540	121,602	123,378	125,557	126,424	126,867	128,548	129,525
R&D S&Es per 10,000 labor force	68.4	NA	72.2	NA	73.6	NA	75.7	NA	74.3

1/ Industry counts are for the average number of full-time equivalent R&D S&Es.

2/ Federal Government counts are for the number of S&Es whose work activity is classified as research or development.

3/ S&E counts for educational institutions and nonprofit organizations are for the number of employed doctoral S&Es who report their primary work activity as research, development or management of R&D.

4/ Number of full-time equivalent graduate students with research assistantships averaging an estimated 50 percent of their time engaged in R&D activities.

5/ Total labor force of the noninstitutional population, age 16 years and over.

6/ This category of primary work activity was not included in the 1993 data.

KEY:
NA = data not available
S = data have been withheld due to imputation of 50 percent or more
S&Es = scientists and engineers

NOTE: The methodology for calculating preliminary R&D scientists and engineers was changed for 1985 and later years. These data are not strictly comparable with calculations previously published.

SOURCE: NSF/SRS, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, *Employment and Earnings* (annual).

Table C-19. Number of employed doctoral scientists and engineers, by field of doctorate and primary work activity: 1993

Page 1 of 2

Field of doctorate	Total	Research & development					Non-research & development			
		Total	Basic research	Applied research	Development	Design 1/	Teaching	Management, sales, and administration	Computer applications	Prof. services/ other
	Thousands									
Total	462.87	191.12	64.46	92.96	23.27	10.44	101.22	81.59	18.68	70.25
Sciences	387.74	154.04	60.75	73.87	14.53	4.89	89.07	65.95	12.58	66.10
Computer and mathematical sciences	27.94	8.32	3.46	3.69	0.52	0.65	11.59	3.46	3.48	1.10
Computer and information sciences	5.14	1.92	0.67	1.00	0.14	0.11	1.36	0.60	1.16	0.10
Mathemathical sciences	22.80	6.40	2.79	2.69	0.38	0.54	10.23	2.85	2.32	1.00
Life and related sciences	124.58	63.93	31.62	27.46	3.95	0.90	21.83	21.12	1.90	15.80
Agricultural and food sciences	15.10	8.00	1.49	5.34	1.03	0.15	2.03	3.35	0.34	1.37
Biological and health sciences	105.63	54.41	29.92	21.00	2.79	0.70	19.11	16.56	1.49	14.07
Environmental sciences	3.85	1.51	0.21	1.12	0.13	0.05	0.70	1.21	0.07	0.36
Physical and related sciences	98.53	52.13	15.79	25.74	8.12	2.49	16.58	18.43	4.89	6.50
Chemistry, except biochemistry	51.76	28.12	6.68	15.29	5.41	0.75	7.89	10.63	1.39	3.72
Geology and oceanography	12.50	6.36	2.72	3.13	0.36	0.15	2.71	2.07	0.56	0.81
Physics and astronomy	33.15	17.12	6.21	7.04	2.31	1.56	5.77	5.52	2.90	1.85
Other physical sciences (incl. earth)	1.12	0.53	0.18	0.27	0.05	N	0.21	0.21	N	0.12
Social and related sciences	136.68	29.66	9.88	16.98	1.95	0.85	39.07	22.94	2.32	42.70
Economics	19.41	6.51	1.69	4.39	0.28	0.14	7.14	3.73	0.20	1.83
Political and related sciences	14.29	2.85	1.05	1.48	0.22	0.10	6.53	3.04	0.16	1.71
Psychology	71.02	11.91	3.81	6.70	0.95	0.46	11.83	9.90	1.17	36.22
Sociology and anthropology	19.79	5.43	2.21	2.88	0.24	0.09	8.49	3.91	0.36	1.61
Other social sciences	12.17	2.96	1.13	1.52	0.26	0.06	5.07	2.36	0.43	1.34

See explanatory information and SOURCE(S) at end of table.

Table C-19. Number of employed doctoral scientists and engineers, by field of doctorate and primary work activity: 1993

Page 2 of 2

Field of doctorate	Total	Research & development					Non-research & development			
		Total	Basic research	Applied research	Development	Design 1/	Teaching	Management, sales, and administration	Computer applications	Prof. services/ other
	Thousands									
Engineering	75.12	37.08	3.70	19.09	8.74	5.55	12.15	15.63	6.10	4.16
Aerospace/aeronautical	3.05	1.29	0.09	0.84	0.27	0.09	0.60	0.65	0.34	0.17
Chemical	11.14	6.35	0.46	3.11	1.83	0.95	0.93	2.66	0.68	0.51
Civil	7.06	3.08	0.21	1.66	0.30	0.91	1.59	1.33	0.47	0.59
Electrical/computer	19.41	9.07	0.90	4.15	2.51	1.50	3.19	4.11	2.26	0.78
Industrial	1.90	0.44	N	0.30	N	0.06	0.77	0.35	0.23	0.11
Mechanical	9.47	4.52	0.58	2.07	1.29	0.58	1.72	2.10	0.72	0.40
Other engineering	23.10	12.33	1.43	6.96	2.50	1.44	3.34	4.42	1.41	1.60

1/ This category of R&D refers to "design" in the context of engineering, e.g., the design of equipment, processes, structures, and prototype models, as opposed to "design" in other contexts, e.g., the design of entire research programs, experiments, etc.

NOTE: All numbers in the table are approximations derived from a sample.

KEY: N = No cases reported (see NOTE).

SOURCE: National Science Foundation/SRS, 1993 Survey of Doctorate Recipients

Table C-20. Scientists and engineers engaged in R&D, and per 10,000 labor force population, by country: 1981-93

Page 1 of 1

Year	Number of scientists and engineers engaged in R&D							Scientists and engineers engaged in R&D						
	United States	Japan	Germany	France	United Kingdom	Italy	Canada	United States	Japan	Germany	France	United Kingdom	Italy	Canada
	Thousands							per 10,000 labor force						
1981	683.3	311.0	124.7	85.5	127.0	52.1	40.5	61.9	54.5	44.0	36.3	47.5	22.9	33.8
1982	711.9	321.0	NA	90.1	128.0	56.7	44.1	63.6	55.6	NA	37.9	48.0	24.9	36.8
1983	751.7	347.4	130.8	92.7	127.0	63.0	45.6	66.4	59.0	45.7	39.1	47.7	27.3	37.4
1984	797.8	357.4	NA	98.2	129.0	62.0	48.7	69.2	60.3	NA	41.1	47.3	26.6	39.3
1985	801.9	380.8	143.6	10.2	131.0	63.8	52.5	68.4	63.9	49.7	42.8	47.3	27.1	41.7
1986	NA	393.0	NA	10.5	134.0	67.8	56.0	NA	65.3	NA	43.7	48.2	28.4	43.7
1987	877.8	415.6	165.6	10.9	134.0	70.6	58.3	72.2	68.3	56.4	45.4	47.9	29.4	44.6
1988	NA	434.6	NA	11.5	137.0	74.8	60.6	NA	70.5	NA	47.6	48.5	30.9	45.4
1989	924.2	457.5	176.4	12.0	133.0	76.1	62.0	73.6	73.0	59.2	49.6	46.8	31.4	45.6
1990	NA	477.9	NA	12.4	133.0	77.9	63.9	NA	74.9	NA	49.9	46.7	31.8	46.4
1991	960.4	491.1	240.8	13.0	131.0	75.2	65.2	75.7	75.5	61.5	51.8	46.3	30.6	47.1
1992	NA	511.4	234.3	14.2	134.0	74.4	NA	NA	77.7	60.2	56.4	47.6	30.2	NA
1993	962.7	526.5	229.8	14.6	140.0	74.4	NA	74.3	79.6	59.4	57.9	49.7	32.7	NA

KEY: NA = not available

NOTES: Table includes scientists and engineers (S&Es) engaged in R&D on a full-time equivalent (FTE) basis with the following exceptions: Japanese data include persons primarily employed in R&D in the natural sciences and engineering; and the U.S. data are a mix of S&Es engaged in R&D on an FTE basis and counts of S&Es whose primary work activity is R&D. The United Kingdom data exclude the private nonprofit sector (about 2-5 percent of total). As a result of ongoing improvements in methodology and measurement, there are major breaks in the continuity of the time series: for France (between 1980-81), the United Kingdom (between 1984-85), and the United States (between 1984-85).

SOURCES: National Science Foundation/SRS, Organisation for Economic Co-operation and Development

Table C-21 International total R&D expenditures and R&D as a percentage of GDP 1981-95

Year	Total R&D Expenditures (Billions of constant 1987 dollars) 1/							R&D expenditures as a percentage of GDP						
	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada
1981	91.41	28.74	20.29	14.09	14.68	5.83	4.38	2.37	2.13	2.43	1.97	2.37	0.87	1.23
1982	95.54	30.87	20.78	15.06	NA	6.03	4.74	2.54	2.22	2.52	2.06	NA	0.90	1.38
1983	102.29	33.48	21.18	15.51	14.41	6.42	4.80	2.62	2.35	2.52	2.11	2.19	0.95	1.35
1984	111.20	35.95	21.59	16.36	NA	6.96	5.21	2.68	2.43	2.51	2.21	NA	1.01	1.39
1985	120.60	40.01	23.74	17.00	15.59	7.95	5.64	2.82	2.58	2.72	2.25	2.27	1.13	1.44
1986	123.32	40.62	24.42	17.21	18.10	8.21	5.94	2.80	2.56	2.73	2.23	2.29	1.13	1.47
1987	125.38	43.42	26.02	17.90	16.76	8.88	5.98	2.76	2.63	2.88	2.27	2.22	1.19	1.42
1988	127.83	46.87	26.85	18.68	17.27	9.45	6.07	2.71	2.67	2.86	2.28	2.18	1.22	1.38
1989	129.89	51.28	27.90	19.81	17.63	9.92	6.17	2.68	2.80	2.87	2.33	2.20	1.24	1.37
1990	134.00	55.49	28.24	20.99	18.00	10.56	6.55	2.73	2.89	2.76	2.41	2.23	1.30	1.46
1991	136.30	57.12	30.17	21.21	16.48	10.92	6.65	2.79	2.86	2.61	2.41	2.16	1.32	1.51
1992	136.20	57.69	30.96	22.13	17.60	11.30	6.90	2.73	2.81	2.48	2.42	2.18	1.31	1.55
1993	133.78	55.96	29.58	21.41	17.50	10.30	7.21	2.60	2.73	2.43	2.45	2.20	1.26	1.59
1994	133.48	55.35	29.70	21.00	17.83	10.06	7.45	2.49	2.69	2.33	2.38	2.19	1.19	1.57
1995 (prelim.)	139.40	NA	28.33	NA	NA	9.67	7.39	2.52	NA	2.27	NA	NA	1.13	1.53

1/ Conversions of foreign currencies to U.S. dollars are calculated with OECD purchasing power parity exchange rates.

2/ Germany's data for 1981-90 are for West Germany.

KEY: NA = not available

NOTES: Data are preliminary for 1995.
Constant 1987 dollars are based on U.S. Department of Commerce calendar year GDP implicit price deflators.

SOURCES: NSF, Division of Science Resources Studies; Organisation for Economic Co-operation and Development

Table C-22 International nondefense R&D expenditures and nondefense R&D as a percentage of GDP 1981-95

Page 1 of 1

Year	Total nondefense R&D Expenditures (Billions of constant 1987 dollars) 1/							Nondefense R&D expenditures as a percentage of GDP						
	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada
1981	68.0	28.7	19.6	11.2	11.4	5.7	4.3	1.77	2.12	2.34	1.57	1.84	0.85	1.20
1982	68.8	30.6	20.1	12.1	NA	5.9	4.6	1.83	2.21	2.44	1.66	NA	0.88	1.34
1983	72.1	33.3	20.4	12.8	11.1	6.2	4.7	1.85	2.34	2.43	1.74	1.69	0.92	1.31
1984	78.0	35.7	20.8	13.5	NA	6.7	5.0	1.88	2.41	2.42	1.82	NA	0.96	1.34
1985	83.3	39.7	22.7	14.1	12.4	7.5	5.5	1.95	2.56	2.60	1.87	1.80	1.07	1.39
1986	84.6	40.3	23.4	14.1	14.7	7.8	5.8	1.92	2.54	2.61	1.84	1.85	1.08	1.42
1987	85.6	43.0	24.9	14.6	13.8	8.5	5.8	1.89	2.61	2.75	1.85	1.83	1.14	1.37
1988	89.0	46.5	25.7	15.2	14.6	8.9	5.9	1.89	2.65	2.74	1.85	1.84	1.15	1.33
1989	93.7	50.8	26.7	16.3	14.9	9.4	6.0	1.94	2.77	2.75	1.92	1.85	1.18	1.32
1990	99.7	55.0	26.9	16.9	15.3	10.2	6.3	2.04	2.87	2.63	1.95	1.89	1.26	1.41
1991	105.5	56.6	29.0	17.5	14.0	10.5	6.5	2.17	2.84	2.51	1.98	1.84	1.27	1.47
1992	106.8	57.1	29.8	18.6	15.2	10.9	6.7	2.14	2.78	2.39	2.03	1.88	1.27	1.51
1993	104.8	55.3	28.7	18.2	15.1	9.9	7.1	2.04	2.70	2.36	2.09	1.89	1.21	1.55
1994	106.9	54.7	28.8	NA	15.3	9.6	7.3	2.00	2.66	2.26	NA	1.88	1.14	1.53
1995 (prelim.)	112.6	NA	NA	NA	NA	NA	7.3	2.04	NA	NA	NA	NA	NA	1.50

1/ Conversions of foreign currencies to U.S. dollars are calculated with OECD purchasing power parity exchange rates.

2/ Germany's data for 1981-90 are for West Germany.

KEY: NA = not available

NOTE: Data are preliminary for 1995.
Constant 1987 dollars are based on U.S. Department of Commerce calendar year GDP implicit price deflators.

SOURCES: NSF, Division of Science Resources Studies; Organisation for Economic Co-operation and Development

Table C-23. Federal R&D budget authority, by budget function: fiscal years 1980-96

Page 1 of 1

Budget function	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996 1/
	Millions of current dollars																(prel.)
Total	29,739	33,735	36,115	38,768	44,214	49,887	53,249	57,069	59,106	62,138	63,781	65,898	68,398	69,884	68,331	68,791	69,069
National defense	14,946	18,413	22,070	24,936	29,287	33,698	36,926	39,152	40,099	40,665	39,925	39,328	40,061	41,249	37,764	37,204	37,791
Health	3,694	3,871	3,869	4,298	4,779	5,418	5,565	6,556	7,076	7,773	8,308	9,226	10,055	10,280	10,993	11,407	11,902
Space research and technology	2,738	3,111	2,584	2,134	2,300	2,725	2,894	3,398	3,683	4,555	5,765	6,511	6,744	6,988	7,414	7,916	7,871
Energy	3,603	3,501	3,012	2,578	2,581	2,389	2,315	2,115	2,155	2,436	2,726	2,953	3,153	2,677	2,873	2,844	2,504
General science	1,233	1,340	1,359	1,502	1,676	1,862	1,873	2,042	2,160	2,373	2,410	2,635	2,659	2,691	2,712	2,794	2,862
Natural resources and environment	999	1,061	965	952	963	1,059	1,062	1,133	1,160	1,255	1,386	1,582	1,688	1,802	2,062	1,988	1,877
Transportation	887	869	791	876	1,040	1,030	917	908	896	1,064	1,045	1,231	1,523	1,703	1,888	1,833	1,752
Agriculture	585	659	693	745	762	836	815	822	882	907	950	1,052	1,155	1,152	1,193	1,194	1,178
Education, training, employment, and social services	468	298	228	189	200	220	248	267	285	347	374	433	365	348	373	369	316
International affairs	125	160	165	177	192	210	211	223	224	279	375	378	371	382	254	287	197
Veterans benefits and services	126	143	139	157	218	193	183	215	195	212	216	219	245	250	265	257	263
Commerce and housing credit	101	106	104	107	110	114	111	110	122	128	140	178	192	220	380	525	426
Community and regional development	119	104	63	44	46	50	59	37	79	57	67	88	95	57	68	70	52
Administration of justice	45	34	31	37	24	47	41	49	51	45	44	51	51	49	46	59	53
Income security	47	43	32	32	26	21	14	25	23	27	33	30	37	36	45	43	24
General government	22	22	10	6	8	17	14	17	17	15	17	4	4	0 2/	0 2/	1	3

1/ Fiscal year 1996 data reflect FY 1996 Omnibus appropriations (Public Law 104-134).

2/ Less than $500,000

NOTES: Data for 1990-95 are actual budget authority. Data for 1996 are preliminary.

SOURCES: Agencies' submissions to Office of Management and Budget Circular No. A-11, Exhibit 44A, "Research and Development Activities"; agency budget justification documents; supplemental data obtained from the agencies' budget offices; and conference report for FY 1996 Omnibus appropriations (Public Law 104-134).

Table C-24. Federal outlays for R&D and other activities, by DOD and non-DOD sources: 1970-96

Page 1 of 1

Year	Federal R&D outlays			All Federal outlays				Percent R&D/total outlays		
	Total	Dept. of Defense (DOD) R&D outlays	Federal non-DOD R&D outlays	Total on-budget outlays	DOD outlays	Interest on National debt	Non-DOD, non-interest outlays	DOD R&D /DOD total	Total Federal R&D / total outlays	Non-DOD R&D / non-DOD, non-interest outlays
	Millions of current dollars							Percent		
1970	15,156	7,447	7,709	168,042	80,123	15,948	71,971	9.29	9.02	10.71
1971	15,358	7,561	7,797	177,346	77,497	16,783	83,066	9.76	8.66	9.39
1972	16,163	8,139	8,024	193,824	77,645	17,584	98,595	10.48	8.34	8.14
1973	16,850	8,441	8,409	200,118	75,033	19,629	105,456	11.25	8.42	7.97
1974	17,593	8,815	8,778	217,270	77,864	23,969	115,437	11.32	8.10	7.60
1975	18,721	9,211	9,510	271,892	84,852	26,047	160,993	10.86	6.89	5.91
1976	20,220	9,301	10,919	302,183	87,917	29,539	184,727	10.58	6.69	5.91
1977	22,083	10,182	11,901	328,502	95,147	32,551	200,804	10.70	6.72	5.93
1978	24,020	10,623	13,397	369,089	102,259	37,861	228,969	10.39	6.51	5.85
1979	25,838	11,497	14,341	403,507	113,605	44,860	245,042	10.12	6.40	5.85
1980	29,154	13,501	15,653	476,618	130,912	54,877	290,829	10.31	6.12	5.38
1981	32,459	15,755	16,704	543,053	153,868	71,062	318,123	10.24	5.98	5.25
1982	34,391	18,251	16,140	594,351	180,714	87,114	326,523	10.10	5.79	4.94
1983	36,659	21,106	15,553	661,272	204,410	91,673	365,189	10.33	5.54	4.26
1984	39,691	22,619	17,072	686,032	220,928	114,432	350,672	10.24	5.79	4.87
1985	44,171	26,742	17,429	769,584	245,154	133,622	390,808	10.91	5.74	4.46
1986	50,609	32,211	18,398	806,838	265,480	140,377	400,981	12.13	6.27	4.59
1987	51,612	33,254	18,358	810,079	273,966	143,942	392,171	12.14	6.37	4.68
1988	54,739	34,157	20,582	861,449	281,935	159,253	420,261	12.12	6.35	4.90
1989	59,450	36,453	22,997	932,261	294,880	180,661	456,720	12.36	6.38	5.04
1990	62,135	36,703	25,432	1,027,450	289,755	200,212	537,483	12.67	6.05	4.73
1991	61,130	33,014	28,117	1,081,944	262,389	214,763	604,792	12.58	5.65	4.65
1992	62,934	34,221	28,714	1,128,518	286,892	223,059	618,567	11.93	5.58	4.64
1993	65,241	34,153	31,089	1,142,088	278,561	225,599	637,928	12.26	5.71	4.87
1994	66,159	34,918	31,241	1,181,469	268,622	232,160	680,687	13.00	5.60	4.59
1995 (prelim.)	67,400	34,998	32,402	1,230,469	259,442	265,478	705,549	13.49	5.48	4.59
1996 (prelim.)	67,653	33,866	33,787	1,270,292	254,258	277,499	738,535	13.32	5.33	4.57

NOTES: DOD R&D outlays are not strictly comparable to "defense R&D" as they do not include Department of Energy defense-related activities. Data are preliminary for 1995 and 1996.

SOURCES: National Science Foundation/SRS, U.S. Department of Commerce, and Office of Management and Budget, *Historical Tables: Budget of the United States Government, Fiscal Year 1997*.

Table C-25 Federal obligations for research and development by agency, fiscal years 1985-96

Page 1 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
						Millions of current collars						
Total, all agencies	48,359.6	51,412.4	55,253.7	56,769.4	61,406.5	63,559.5	61,295.2	65,592.6	67,314.0	67,255.8	70,093.9	68,842.4
Department of Agriculture, total	943.0	928.5	947.9	1,016.6	1,038.3	1,108	1,236.6	1,327.1	1,327.8	1,399.6	1,390.3	1,393.1
Agricultural Research Service	469.7	463.4	478.6	505.7	523.5	545.5	591.0	627.1	627.2	678.7	683.9	681.6
Cooperative State Research Service	284.3	269.0	270.7	298.4	307.3	324.2	376.8	418.2	418.6	429.0	419.0	419.4
Forest Service	113.1	113.3	126.7	135.5	131.4	158.6	174.7	180.7	182.7	193.1	199.7	203.8
Other	75.9	82.8	71.9	77.0	76.1	80.1	94.1	101.1	99.3	98.8	87.7	88.3
Department of Commerce, total	398.8	399.2	402.2	388.9	397.9	438.2	489.6	651.2	656.3	826.1	1,352.2	1,325.8
National Institute of Standards & Technology	100.5	100.8	98.6	107.9	115.5	122.3	140.0	179.0	207.2	253.2	796.0	718.0
National Oceanic & Atmospheric Administration	269.8	274.7	286.1	263.0	268.6	300.1	338.0	462.4	439.5	562.6	544.3	594.1
Other	28.5	23.7	17.5	18.0	13.8	15.8	11.6	9.8	9.6	10.3	11.9	13.7
Department of Defense, total	29,791.5	32,937.9	35,231.5	35,248.9	37,576.9	37,268.1	32,134.8	36,129.5	35,849.1	34,566.1	35,423.5	33,706.0
Department of the Army	4,570.8	4,809.4	5,019.5	4,806.0	5,659.3	5,684.1	6,081.5	6,854.2	6,209.1	5,574.1	5,587.2	4,547.4
Department of the Navy	9,127.4	9,650.3	9,507.8	9,514.1	9,666.1	9,586.2	7,806.0	8,030.8	9,102.9	8,929.0	9,240.2	8,421.9
Department of the Air Force	13,260.9	13,593.8	15,347.7	14,867.3	15,237.4	14,831.4	10,937.5	13,427.1	12,635.3	12,527.4	12,782.3	13,282.5
Defense Agencies	2,781.7	4,767.4	5,219.7	5,832.9	6,858.9	6,945.2	7,072.5	7,571.7	7,647.0	7,292.5	7,567.6	7,178.4
Operational Test and Evaluation, Director	NA	0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.3	11.2	19.1	22.7
Test & Evaluation, Deputy Under Secretary Defense	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	242.5	231.8	227.0	253.0
Department of Education, total	124.9	121.3	132.5	140.7	159.1	169.9	171.0	168.5	177.7	176.6	200.7	188.3
Department of Energy, total	4,966.0	4,688.3	4,757.2	5,036.4	5,192.6	5,630.6	5,983.1	6,172.2	6,262.1	6,048.0	6,418.6	6,842.3
Department of Health & Human Services, total	5,451.0	5,657.6	6,606.3	7,158.0	7,902.8	8,405.6	9,756.0	8,987.8	10,349.2	11,021.5	11,451.3	11,828.2
Centers for Disease Control	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	162.5	206.8	216.9	217.1
Food and Drug Administration	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	154.5	169.4	170.4	171.8
National Institutes of Health 1/	5,205.3	5,401.2	6,326.4	6,845.7	7,474.0	7,979.2	9,156.1	8,409.2	9,765.1	10,329.4	10,694.4	11,121.1
Other	116.0	124.8	128.7	132.6	212.0	231.8	361.5	296.0	267.1	315.9	369.6	318.2

See explanatory information and SOURCE at end of table.

Table C-25. Federal obligations for research and development, by agency: fiscal years 1985-96

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary	
											1995	1996
	Millions of current dollars											
Department of Housing and Urban Development, total	18.5	15.3	16.3	18.4	18.0	19.3	27.8	25.1	23.6	39.6	42.5	42.5
Department of Interior, total	391.7	385.2	403.8	416.8	469.0	508.5	592.9	609.2	619.1	694.1	687.1	683.2
Bureau of Mines	89.9	84.4	88.8	91.3	98.7	99.3	106.1	107.1	111.9	107.9	105.2	86.8
Geological Survey	214.9	218.6	226.8	236.1	279.9	308.4	356.6	361.4	356.7	371.1	362.7	371.8
US Fish & Wildlife Service 2/	49.0	47.0	53.3	59.2	60.6	69.4	81.0	85.1	86.5	NA	NA	NA
Other	37.9	35.2	34.9	30.2	29.8	31.4	49.2	55.6	64.0	215.1	219.2	224.6
Department of Justice, total	36.0	36.5	42.4	43.1	38.2	40.5	48.9	48.0	48.9	45.0	50.9	53.5
Department of Labor, total	13.3	10.4	21.6	35.6	35.4	73.0	44.0	51.7	55.0	59.7	67.0	67.2
Department of State, total	1.5	1.5	3.0	4.2	4.7	4.7	5.9	5.6	5.3	8.2	6.4	5.4
Department of Transportation, total	428.9	385.5	325.0	304.6	303.3	366.6	379.9	445.0	545.3	620.7	771.3	710.1
Federal Aviation Administration	286.3	260.6	167.3	160.5	146.8	216.1	220.1	236.2	248.9	285.6	295.5	287.9
Federal Highway Administration	49.0	45.5	76.7	74.1	91.0	91.5	86.9	130.2	174.9	235.7	356.5	0.0
Federal Railroad Administration	15.0	15.4	11.2	10.0	9.0	10.2	15.9	22.7	25.2	19.5	33.6	40.0
National Highway Traffic Safety Administration	28.1	22.4	27.9	28.3	29.7	16.9	21.4	25.8	31.6	25.3	25.9	20.2
Other 3/	50.5	41.6	41.9	31.7	26.8	31.9	35.6	30.1	64.7	54.6	59.8	362.0
Department of Treasury, total	24.3	24.0	26.9	26.1	25.6	25.6	30.8	24.6	16.6	19.0	51.6	52.8
Department of Veterans Affairs, total	226.6	186.2	209.5	215.3	234.7	237.7	216.6	223.9	236.2	248.0	260.4	258.0
Agency for International Development	220.4	251.2	217.5	204.4	279.1	334.6	377.7	365.9	382.2	254.3	288.3	222.0
Environmental Protection Agency	320.4	317.3	348.2	347.4	380.3	419.7	432.6	483.9	495.3	553.5	583.6	676.4
National Aeronautics and Space Administration	3,327.2	3,419.8	3,787.1	4,330.4	5,393.5	6,533.2	7,280.2	7,657.6	8,019.9	8,296.2	8,571.4	8,105.7

See explanatory information and SOURCE at end of table.

Table C-25 Federal obligations for research and development, by agency: fiscal years 1985-96

Page 3 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
National Science Foundation	1,345.6	1,353.3	1,470.5	1,532.8	1,670.4	1,689.5	1,785.2	1,868.4	1,881.9	2,040.4	2,145.4	2,303.1
Nuclear Regulatory Commission	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.8	90.7	86.0	81.8
Smithsonian Institution	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	102.0	124.2	125.2	129.2
Tennessee Valley Authority	79.5	77.5	77.9	87.3	62.6	64.9	68.3	97.3	108.6	97.9	93.1	103.4
All other agencies 4/	29.4	28.8	32.4	29.9	29.1	28.1	26.5	33.1	32.1	26.4	27.1	64.4

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its functions became associated with NIH.

2/ As of Fiscal Year 1994, the National Biological Service performs all biological research activities formerly funded by the US Fish & Wildlife Service and the National Park Service.

3/ For Fiscal Year 1996, monies slated for "infrastructure investment" represent a proposed consolidation of several agencies with the Department of Transportation.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services. The Social Security Administration's preliminary R&D obligations for 1996 is $37.2 million, explaining the rise in R&D obligations for "all other agencies" between 1995 and 1996.

KEY: NA = not applicable

NOTES: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.

Table C-26 Federal obligations for basic research, by agency: fiscal years 1985-96

Page 1 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary	
											1995	1996
	Millions of current dollars											
Total, all agencies	7,818.7	8,153.1	8,942.4	9,473.6	10,602.0	11,285.6	12,170.8	12,489.9	13,399.1	13,552.9	13,569.1	14,037.4
Department of Agriculture, total	445.4	432.9	445.5	480.6	484.9	519.2	557.6	595.2	615.9	606.3	603.1	615.3
Agricultural Research Service	250.2	247.7	253.4	271.1	282.7	294.0	309.7	326.1	341.0	366.5	369.3	368.1
Cooperative State Research Service	141.5	131.7	132.8	145.8	142.6	153.7	170.4	189.6	192.5	194.7	191.9	204.3
Forest Service	44.1	42.2	49.4	51.6	50.0	60.3	66.6	68.9	69.4	33.3	34.3	35.2
Other	9.6	11.3	9.9	12.1	9.6	11.2	10.9	10.6	13.0	11.8	7.6	7.7
Department of Commerce, total	23.2	26.5	25.8	30.9	29.1	31.4	34.3	34.5	37.2	40.1	45.4	48.6
National Institute of Standards & Technology	22.1	25.7	25.1	26.3	27.9	28.6	31.9	33.6	36.5	39.8	45.1	48.3
National Oceanic & Atmospheric Administration	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Other	1.1	0.8	0.7	1.4	1.2	2.8	2.4	0.9	0.4	0.3	0.3	0.3
Department of Defense, total	861.4	923.9	907.6	876.9	947.9	947.6	994.2	1,098.9	1,268.2	1,222.3	1,282.0	1,196.1
Department of the Army	240.8	248.5	217.0	165.7	187.2	185.1	188.6	204.9	215.7	213.3	230.0	211.3
Department of the Navy	343.1	337.3	354.3	341.8	354.0	365.0	388.0	393.8	422.0	400.1	415.1	402.6
Department of the Air Force	198.3	216.5	221.6	196.4	202.8	197.0	209.2	205.8	218.7	242.4	228.1	239.9
Defense Agencies	79.2	121.7	114.8	173.0	203.9	200.5	208.3	294.4	411.8	366.5	408.8	342.3
Operational Test and Evaluation, Director	NA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test & Evaluation, Deputy Under Secretary Defense	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Education, total	14.6	4.5	3.1	4.4	4.4	4.9	8.6	7.5	5.3	5.5	5.8	5.4
Department of Energy, total	942.6	959.7	1,068.5	1,184.8	1,410.9	1,504.8	1,686.5	1,736.4	1,754.8	1,603.2	1,693.8	1,785.9
Department of Health & Human Services, total	3,232.5	3,338.8	3,827.9	4,081.4	4,388.0	4,649.0	5,050.1	5,058.7	5,696.7	5,884.0	6,085.2	6,309.3
Centers for Disease Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food and Drug Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Institutes of Health 1/	3,214.8	3,322.0	3,807.7	4,060.9	4,361.3	4,647.9	5,048.6	5,057.4	5,695.6	5,882.4	6,083.7	6,308.0
Other	17.7	16.8	20.2	20.5	26.7	1.1	1.5	1.3	1.1	1.6	1.5	1.3

See explanatory information, if any, and SOURCE at end of table.

Table C-26 Federal obligations for basic research, by agency: fiscal years 1985-96

Page 2 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
Department of Housing and Urban Development, total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Interior, total	138.3	133.0	134.9	126.5	188.9	205.4	229.3	230.9	230.3	83.2	79.2	76.0
Bureau of Mines	49.9	44.9	45.6	32.1	43.9	40.6	42.8	43.7	44.6	25.4	23.3	18.8
Geological Survey	80.5	83.4	84.9	89.5	140.2	159.1	179.1	180.1	178.0	43.5	41.6	42.8
US Fish & Wildlife Service 2/	5.7	3.6	4.3	4.8	4.8	5.6	6.2	6.4	6.4	NA	NA	NA
Other	2.2	1.1	0.1	0.1	0.0	0.1	1.2	0.7	1.3	14.3	14.3	14.4
Department of Justice, total	4.2	5.3	8.1	7.6	6.8	8.8	6.4	5.3	5.0	5.9	5.7	6.0
Department of Labor, total	3.3	0.9	1.4	0.4	0.3	0.3	0.3	0.2	5.6	5.8	11.8	11.7
Department of State, total	0.0	0.0	2.6	3.1	3.4	3.5	4.6	4.9	4.8	7.8	6.0	5.0
Department of Transportation, total	1.1	0.6	0.2	0.0	0.0	0.0	0.0	1.2	1.7	3.0	3.5	1.9
Federal Aviation Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Federal Highway Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.7	3.0	3.5	0.0
Federal Railroad Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Highway Traffic Safety Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other 3/	1.1	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
Department of Treasury, total	4.8	5.1	4.7	4.8	3.4	3.4	3.6	3.6	6.5	0.0	0.0	0.0
Department of Veterans Affairs, total	15.4	14.8	17.2	17.3	16.6	16.2	16.1	15.7	13.3	14.4	13.5	13.0
Agency for International Development	1.7	4.3	2.8	3.0	3.1	5.0	5.7	5.8	8.4	1.8	0.7	1.3
Environmental Protection Agency	38.6	38.5	31.1	27.2	50.7	73.6	91.2	110.4	89.1	101.4	102.2	119.7
National Aeronautics and Space Administration	750.9	916.7	1,013.7	1,112.7	1,417.4	1,636.9	1,705.6	1,738.2	1,800.1	1,963.9	1,536.1	1,593.0

See explanatory information, if any, and SOURCE at end of table.

Table C-26. Federal obligations for basic research, by agency: fiscal years 1985-96

Page 3 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary	
											1995	1996
	Millions of current dollars											
National Science Foundation	1,261.8	1,275.2	1,371.2	1,433.2	1,562.6	1,586.3	1,676.2	1,741.5	1,743.8	1,870.7	1,960.4	2,107.6
Nuclear Regulatory Commission	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smithsonian Institution	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	102.0	124.2	125.2	129.2
Tennessee Valley Authority	5.5	7.3	3.9	3.2	2.9	4.7	1.9	2.1	9.9	8.9	9.0	11.8
All other agencies	2.3	1.8	0.7	0.5	0.5	0.6	0.6	0.9	0.5	0.5	0.5	0.6

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its functions became associated with NIH.

2/ As of fiscal year 1994, the National Biological Service performs all biological research activities formerly funded by the US Fish & Wildlife Service and the National Park Service.

3/ For fiscal year 1996, monies slated for "infrastructure investment" represent a proposed consolidation of several agencies with the Department of Transportation.

KEY: NA = not applicable

NOTE: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996

Table C-27. Federal obligations for applied research, by agency: fiscal years 1985-96

Page 1 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
Total, all agencies	8,314.7	8,349.1	8,998.1	9,176.5	10,163.5	10,336.8	11,797.6	12,000.7	13,491.4	13,887.5	14,234.8	14,233.5
Department of Agriculture, total	465.6	463.5	473.4	504.6	517.3	542.1	617.9	665.8	635.8	715.9	708.0	698.8
Agricultural Research Service	191.8	188.3	201.1	208.2	209.4	218.2	241.1	257.1	233.3	257.9	259.9	259.0
Cooperative State Research Service	142.8	137.4	138.0	152.6	164.7	170.5	206.4	228.6	226.2	234.3	227.1	215.1
Forest Service	65.7	67.5	73.5	79.9	77.5	93.5	103.6	106.9	107.8	156.5	160.6	163.7
Other	65.3	70.3	60.8	63.9	65.7	59.9	66.8	73.2	68.5	67.2	60.4	61.0
Department of Commerce, total	301.0	312.9	312.8	311.5	321.9	345.6	415.4	561.4	544.9	678.2	948.3	968.4
National Institute of Standards & Technology	64.5	63.5	64.3	72.6	77.6	83.2	92.5	115.8	136.4	167.5	441.6	410.9
National Oceanic & Atmospheric Administration	224.4	237.5	234.4	225.0	234.6	252.4	315.6	438.7	401.4	502.7	497.3	546.4
Other	12.1	11.9	14.1	13.9	9.7	10.0	7.3	6.9	7.1	8.0	9.4	11.1
Department of Defense, total	2,306.9	2,303.3	2,440.0	2,362.2	2,708.2	2,581.6	2,723.8	2,974.5	3,515.2	3,040.0	3,169.0	2,948.9
Department of the Army	582.6	578.8	692.9	588.0	636.3	595.2	671.9	727.8	802.8	639.3	664.2	472.5
Department of the Navy	448.2	447.1	432.5	406.0	429.2	442.6	486.0	499.0	574.1	447.0	501.9	480.3
Department of the Air Force	538.4	542.5	563.2	576.7	604.6	579.3	621.2	584.7	669.1	571.9	682.8	673.7
Defense Agencies	737.7	735.0	751.3	791.5	1,038.1	964.6	944.7	1,162.9	1,469.2	1,381.7	1,320.1	1,322.4
Operational Test and Evaluation, Director	NA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test & Evaluation, Deputy Under Secretary Defense	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Education, total	77.3	91.3	103.8	106.6	117.5	125.3	123.1	119.5	128.3	131.2	143.4	142.6
Department of Energy, total	1,198.4	1,080.7	1,029.4	1,050.6	1,020.8	1,065.7	1,587.2	1,676.1	1,685.4	1,679.2	1,817.6	1,771.9
Department of Health & Human Services, total	1,795.8	1,850.8	2,194.0	2,415.6	2,700.4	2,818.1	3,112.4	2,886.8	3,495.9	3,852.5	4,029.2	4,110.3
Centers for Disease Control	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	162.5	206.8	216.9	217.1
Food and Drug Administration	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	154.5	169.4	170.4	171.8
National Institutes of Health 1/	1,589.8	1,660.5	1,980.2	2,172.2	2,393.2	2,489.1	2,657.4	2,341.3	2,942.9	3,197.4	3,311.9	3,443.8
Other	76.3	58.7	62.6	63.7	90.4	134.4	216.6	262.9	236.0	278.9	330.0	277.6

See explanatory information and SOURCE at end of table.

Table C-27. Federal obligations for applied research, by agency: fiscal years 1985-96

Page 2 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
Department of Housing and Urban Development, total	6.5	5.3	5.5	6.3	6.1	6.6	9.4	8.8	8.1	13.7	15.2	15.3
Department of Interior, total	231.0	234.9	247.3	266.0	253.0	269.8	324.1	339.7	349.8	566.9	562.6	563.8
Bureau of Mines	36.7	36.6	39.6	54.1	49.3	49.3	56.2	59.2	60.4	70.0	66.9	55.2
Geological Survey	130.0	127.8	131.7	135.8	126.8	134.2	159.3	164.3	165.9	311.9	307.2	315.0
US Fish & Wildlife Service 2/	32.2	38.1	43.3	48.7	49.1	56.4	64.8	64.8	64.8	NA	NA	NA
Other	32.1	32.4	32.7	27.4	27.8	29.9	43.8	51.4	58.7	185.0	188.5	193.6
Department of Justice, total	15.1	17.0	11.8	9.8	10.7	11.1	14.7	15.0	20.5	20.0	21.8	23.4
Department of Labor, total	9.1	8.7	19.0	26.4	21.8	21.3	24.0	23.6	13.4	13.7	18.7	23.6
Department of State, total	1.5	1.5	0.3	1.0	1.3	1.2	1.3	0.7	0.5	0.4	0.4	0.4
Department of Transportation, total	70.2	67.6	68.6	91.2	120.5	119.2	114.6	155.7	224.4	270.4	363.7	311.3
Federal Aviation Administration	17.3	14.0	11.1	13.3	23.6	26.1	24.0	30.1	59.8	79.5	87.0	78.0
Federal Highway Administration	6.3	14.7	20.7	43.7	56.6	57.6	46.1	72.0	90.1	131.2	204.4	0.0
Federal Railroad Administration	11.4	12.5	10.4	8.2	7.5	8.5	13.2	18.9	20.9	16.1	21.3	16.2
National Highway Traffic Safety Administration	20.9	16.1	18.9	19.1	26.2	16.9	21.4	25.8	31.6	25.3	25.9	20.2
Other 3/	14.3	10.3	7.5	6.9	6.6	10.1	9.9	8.9	22.0	18.3	25.1	196.9
Department of Treasury, total	13.6	12.7	12.7	11.1	13.0	15.3	20.6	17.2	4.6	9.2	36.7	37.8
Department of Veterans Affairs, total	193.7	155.1	173.1	178.8	197.1	199.4	177.7	185.2	194.1	209.1	220.4	218.5
Agency for International Development	158.1	180.7	151.2	132.1	216.0	300.2	351.7	294.2	350.8	214.4	230.8	190.7
Environmental Protection Agency	176.0	179.3	246.1	240.7	222.6	241.6	261.9	293.9	272.4	301.0	310.8	371.6
National Aeronautics and Space Administration	1,032.7	1,152.3	1,255.5	1,218.9	1,461.4	1,423.8	1,665.6	1,491.1	1,748.6	1,876.7	1,331.5	1,483.5

See explanatory information and SOURCE at end of table.

Table C-27. Federal obligations for applied research, by agency: fiscal years 1985-96

Page 3 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary	
											1995	1996
	Millions of current dollars											
National Science Foundation	83.8	78.1	99.3	99.6	107.8	103.3	109.0	126.9	138.1	169.7	185.0	195.4
Nuclear Regulatory Commission	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.8	90.7	86.0	81.8
Smithsonian Institution	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tennessee Valley Authority	8.9	10.5	13.8	15.3	11.7	17.0	16.9	22.2	18.1	17.0	17.4	19.3
All other agencies 4/	19.5	19.1	18.0	19.7	19.6	19.8	17.5	23.4	22.7	17.6	18.3	56.2

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its functions became associated with NIH.

2/ As of fiscal year 1994, the National Biological Service performs all biological research activities formerly funded by the US Fish & Wildlife Service and the National Park Service.

3/ For fiscal year 1996, monies slated for "infrastructure investment" represent a proposed consolidation of several agencies with the Department of Transportation.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services. The Social Security Administration's preliminary R&D obligations for 1996 is $37.2 million, explaining the rise in R&D obligations for "all other agencies" between 1995 and 1996.

KEY: NA = not applicable

NOTES: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996

Table C-28. Federal obligations for development, by agency: fiscal years 1985-96

Page 1 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
Total, all agencies	32,226.1	34,910.2	37,313.2	38,119.3	40,641.0	41,937.1	37,326.8	41,102.0	40,423.5	39,815.4	42,290.0	40,571.5
Department of Agriculture, total	32.0	32.1	29.0	31.4	36.1	47.1	61.2	66.1	76.1	77.4	79.2	79.0
Agricultural Research Service	27.7	27.4	24.0	26.3	31.4	33.3	40.2	43.9	52.8	54.3	54.7	54.5
Cooperative State Research Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Service	3.3	3.6	3.8	4.0	3.9	4.8	4.5	4.9	5.5	3.3	4.8	4.9
Other	1.0	1.1	1.2	1.1	0.8	9.0	16.5	17.3	17.8	19.8	19.7	19.6
Department of Commerce, total	74.6	59.7	63.7	46.6	46.9	61.2	39.9	55.3	74.2	107.8	358.5	308.8
National Institute of Standards & Technology	14.0	11.6	9.3	9.1	10.0	10.5	15.6	29.6	34.3	45.9	309.4	258.8
National Oceanic & Atmospheric Administration	45.4	37.2	51.7	34.8	34.1	47.7	22.4	23.7	37.8	59.9	47.0	47.7
Other	15.2	10.9	2.7	2.7	2.8	3.0	1.9	2.0	2.1	2.0	2.1	2.3
Department of Defense, total	26,623.2	29,710.7	31,884.0	32,009.7	33,920.8	33,738.9	28,416.9	32,056.1	31,065.7	30,303.8	30,972.5	29,561.0
Department of the Army	3,747.4	3,982.1	4,109.6	4,052.3	4,835.9	4,903.8	5,221.0	5,921.5	5,190.5	4,721.5	4,693.0	3,863.6
Department of the Navy	8,336.1	8,865.9	8,721.1	8,766.2	8,882.9	8,778.6	6,932.0	7,138.0	8,106.8	8,081.9	8,323.2	7,539.1
Department of the Air Force	12,524.3	12,834.8	14,562.9	14,094.2	14,430.0	14,055.1	10,107.1	12,636.6	11,747.5	11,713.1	11,871.4	12,369.0
Defense Agencies	1,964.8	3,910.7	4,353.5	4,868.4	5,616.8	5,780.2	5,919.4	6,114.4	5,766.0	5,544.3	5,838.7	5,513.7
Operational Test and Evaluation, Director	NA	0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.3	11.2	19.1	22.7
Test & Evaluation, Deputy Under Secretary Defense	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	242.5	231.8	227.0	253.0
Department of Education, total	33.0	25.5	25.6	29.7	37.2	39.7	39.4	41.5	44.1	39.9	51.5	40.3
Department of Energy, total	2,825.0	2,648.0	2,659.4	2,801.0	2,760.9	3,060.1	2,709.5	2,759.7	2,821.9	2,765.5	2,907.1	3,281.5
Department of Health & Human Services, total	422.7	468.0	584.3	661.1	814.4	938.5	1,593.5	1,042.3	1,156.6	1,285.1	1,337.0	1,408.6
Centers for Disease Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food and Drug Administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Institutes of Health 1/	400.7	418.7	538.4	612.6	719.5	842.2	1,450.1	1,010.5	1,126.6	1,249.6	1,298.7	1,369.4
Other	22.0	49.3	45.9	48.5	94.9	96.3	143.4	31.8	30.0	35.5	38.3	39.2

See explanatory information and SOURCE at end of table.

Table C-28. Federal obligations for development, by agency: fiscal years 1985-96

Page 2 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
Department of Housing and Urban Development, total	12.0	10.1	10.8	12.1	11.9	12.7	18.4	16.3	15.5	25.9	27.3	27.2
Department of Interior, total	22.4	17.3	21.7	24.3	27.1	33.3	39.5	38.6	39.0	43.9	45.3	43.3
Bureau of Mines	3.3	2.8	3.6	5.2	5.4	9.4	7.1	4.2	6.9	12.5	15.0	12.8
Geological Survey	4.4	7.4	10.3	10.9	12.9	15.1	18.2	16.9	12.8	15.7	14.0	14.0
US Fish & Wildlife Service 2/	11.1	5.3	5.7	5.7	6.7	7.4	10.0	13.9	15.3	NA	NA	NA
Other	3.6	1.8	2.1	2.5	2.1	1.4	4.2	3.6	4.0	15.7	16.3	16.5
Department of Justice, total	16.7	14.1	22.5	25.7	20.6	20.6	27.8	27.7	23.3	19.2	23.5	24.1
Department of Labor, total	0.9	0.9	1.2	8.9	13.3	51.4	19.7	27.9	36.1	40.1	36.5	31.9
Department of State, total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Transportation, total	357.6	317.3	256.2	213.4	182.9	247.4	265.3	288.1	319.3	347.4	404.1	396.9
Federal Aviation Administration	269.0	246.6	156.2	147.3	123.2	189.9	196.2	206.1	189.1	206.1	208.5	209.8
Federal Highway Administration	42.6	30.8	56.0	30.4	34.4	33.8	40.8	57.0	83.1	101.5	148.5	0.0
Federal Railroad Administration	3.6	2.9	0.8	1.8	1.5	1.7	2.7	3.9	4.3	3.4	12.4	23.8
National Highway Traffic Safety Administration	7.2	6.3	9.0	9.2	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other 3/	35.2	30.7	34.2	24.7	20.3	22.0	25.6	21.1	42.8	36.4	34.7	163.3
Department of Treasury, total	6.0	6.3	9.5	10.2	9.3	6.9	6.7	3.8	5.5	9.8	14.9	14.9
Department of Veteranes Affairs, total	17.5	16.3	19.2	19.2	21.0	22.1	22.8	23.0	28.7	24.5	26.5	26.5
Agency for International Development	60.5	66.2	63.5	69.3	60.0	29.3	20.4	65.9	23.0	38.1	56.9	30.0
Environmental Protection Agency	105.8	99.5	71.0	79.5	107.0	104.5	79.5	79.6	133.7	151.2	170.7	185.0
National Aeronautics and Space Administration	1,543.6	1,350.8	1,517.8	1,998.8	2,514.7	3,472.6	3,909.1	4,428.3	4,471.1	4,455.7	5,703.8	5,029.3

See explanatory information and SOURCE at end of table.

Table C-28 Federal obligations for development, by agency: fiscal years 1985-96

Page 3 of 3

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	preliminary 1995	preliminary 1996
	Millions of current dollars											
National Science Foundation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Regulatory Commission	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smithsonian Institution	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tennessee Valley Authority	65.1	59.8	60.2	68.8	48.0	43.2	49.5	72.9	80.6	71.9	66.7	72.2
All other agencies	7.5	7.6	13.6	9.6	8.9	7.6	7.7	8.9	9.1	8.2	8.0	8.0

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its functions became associated with NIH.

2/ As of fiscal year 1994, the National Biological Service performs all biological research activities formerly funded by the US Fish & Wildlife Service and the National Park Service.

3/ For fiscal year 1996, monies slated for "infrastructure investment" represent a proposed consolidation of several agencies with the Department of Transportation.

KEY: NA = not applicable

NOTES: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996.

Table C-29. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1984-94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Total		74,800	84,239	87,823	92,155	97,015	102,055	109,727	116,952	119,110	117,400	119,595
Food, kindred, and tobacco products	20,21	D	D	D	1,206	D	D	D	1,277	1,386	1,345	1,476
Textiles and apparel	22,23	D	D	D	D	D	D	D	D	D	D	D
Lumber, wood products, and furniture	24,25	143	147	144	137	D	192	216	D	D	D	D
Paper and allied products	26	D	D	D	D	D	879	1,059	D	D	D	D
Chemicals and allied products	28	7,927	8,540	8,843	9,635	11,067	12,069	13,291	14,648	15,381	D	D
Industrial chemicals	281-82,286	3,240	3,498	3,552	3,716	4,172	4,451	5,010	5,390	5,165	D	D
Drugs and medicines	283	D	D	3,658	D	4,906	D	D	D	7,944	9,146	9,633
Other chemicals	284-85,287-89	D	D	1,633	D	1,989	D	D	D	2,272	D	D
Petroleum refining and extraction	13,29	D	D	D	1,897	1,997	2,180	2,306	2,498	2,277	2,152	1,950
Rubber products	30	D	D	D	D	D	D	D	D	D	D	D
Stone, clay, and glass products	32	D	D	950	995	D	D	D	D	D	538	591
Primary metals	33	D	D	D	730	637	686	739	714	522	669	690
Ferrous metals and products	331-32,3398-99	D	D	D	D	253	D	D	D	D	289	D
Nonferrous metals and products	333-36	336	416	458	D	384	D	D	D	D	380	D
Fabricated metal products	34	842	829	895	783	881	904	939	974	1,017	1,158	1,111
Machinery	35	10,504	12,216	D	D	D	D	14,446	14,775	14,938	8,381	8,110
Office, computing, and accounting machines	357	D	D	D	D	D	D	D	D	D	4,950	4,106
Other machinery, except electrical	351-56,358-59	D	D	2,396	2,428	2,682	2,729	D	D	D	3,431	4,004
Electrical equipment	36	13,778	14,432	14,980	15,848	14,128	13,318	13,400	13,415	13,360	13,349	15,338
Radio and TV receiving equipment	365	D	D	133	139	149	96	114	D	D	D	D
Communication equipment	366	8,685	9,397	9,669	10,184	8,427	7,071	5,928	4,787	D	D	D
Electronic components	367	2,831	3,385	D	4,286	4,133	4,025	3,914	D	3,567	5,311	6,032
Other electrical equipment	361-64,369	D	D	D	1,239	1,419	2,126	3,444	D	D	D	D
Transportation equipment	37	D	D	31,275	34,246	34,775	33,859	31,361	27,428	27,494	27,258	28,087
Motor vehicles and motor vehicles equipment	371	6,057	6,984	D	D	D	D	D	D	D	D	D
Other transportation equipment	373-75,379	D	D	D	D	D	D	D	D	D	D	D
Aircraft and missiles	372,376	18,858	22,231	21,050	24,458	24,168	22,331	20,635	16,629	17,158	15,056	14,260

See explanatory information and SOURCE at end of table.

Table C-29. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1984-94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Professional and scientific instruments	38	4,602	5,013	5,103	5,222	5,530	5,992	7,055	8,705	9,542	10,119	11,441
Scientific and mechanical measuring instruments	381-82	D	D	D	D	1,959	2,366	3,346	D	5,156	5,681	6,952
Optical, surgical, photographic, and other instruments	384-87	D	D	D	D	3,571	3,626	3,709	D	4,386	4,438	4,489
Other manufacturing industries	27,31,39	D	D	382	D	D	D	D	D	660	D	D
Nonmanufacturing industries 1/		4,905	6,714	7,446	7,844	10,513	14,031	20,793	28,446	28,933	30,831	28,846
Distribution by size of company (number of employees) total		74,800	84,239	87,823	92,155	97,015	102,055	109,727	116,952	119,110	117,400	119,595
Fewer than 500		4,402	5,866	7,071	7,163	S	7,809	S	13,172	13,557	14,620	13,966
500 to 999		1,439	1,648	1,902	1,725	1,669	1,825	2,154	8,000	7,958	3,230	3,608
1,000 to 4,999		5,520	6,240	7,472	7,262	7,622	7,881	8,411	10,453	11,886	13,334	14,617
5,000 to 9,999		3,251	4,022	4,251	4,501	5,245	5,756	6,746	8,049	8,258	9,135	8,912
10,000 to 24,999		11,351	11,109	10,493	12,043	11,506	10,450	12,486	15,770	15,744	15,421	15,972
25,000 or more		48,837	55,354	56,991	59,461	63,694	68,335	71,030	61,508	61,707	61,659	62,519

1/ Nonmanufacturing industries for 1991 and later years included SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.
Nonmanufacturing industries for 1990 and prior years included SICs: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY:

D = Data have been withheld to avoid disclosing operations of individual companies.
S = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
SIC = standard industrial classification

NOTES: As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-30. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1984-94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Total		51,404	57,043	59,932	61,403	66,672	73,501	81,602	90,580	94,388	94,591	97,131
Food, kindred, and tobacco products	20,21	1,081	1,136	1,280	1,204	1,173	1,244	1,248	1,277	1,386	1,345	1,476
Textiles and apparel	22,23	182	218	246	243	215	S	260	236	261	286	316
Lumber, wood products, and furniture	24,25	143	147	144	137	165	192	216	200	234	196	201
Paper and allied products	26	594	576	538	604	752	879	1,059	1,174	1,182	1,191	1,263
Chemicals and allied products	28	7,736	8,310	8,664	9,445	10,828	11,943	13,168	14,439	15,091	16,658	16,559
Industrial chemicals	281-82,286	3,057	3,281	3,374	3,531	3,939	4,340	4,902	5,225	4,911	5,165	4,780
Drugs and medicines	283	3,310	3,481	3,657	4,095	4,900	5,512	5,917	6,947	7,934	9,132	9,625
Other chemicals	284-85,287-89	1,369	1,548	1,633	1,819	1,989	2,091	2,349	2,267	2,246	2,361	2,154
Petroleum refining and extraction	13,29	2,245	2,194	1,971	1,883	1,975	2,162	2,289	2,487	2,268	2,138	1,939
Rubber products	30	671	659	655	596	718	867	1,056	D	1,256	1,059	1,432
Stone, clay, and glass products	32	705	825	941	985	697	615	538	455	479	529	553
Primary metals	33	683	730	786	711	620	666	717	706	514	646	672
Ferrous metals and products	331-32,3398-99	357	323	336	249	252	244	231	225	221	272	241
Nonferrous metals and products	333-36	326	407	450	462	368	422	486	481	293	374	431
Fabricated metal products	34	773	780	800	633	718	726	736	748	723	936	868
Machinery	35	9,312	10,721	10,701	10,577	11,929	13,342	13,575	13,720	13,903	8,295	8,011
Office, computing, and accounting machines	357	7,011	8,418	8,380	8,193	9,347	10,725	10,988	10,419	10,614	4,917	4,078
Other machinery, except electrical	351-56,358-59	2,301	2,303	2,321	2,384	2,582	2,618	2,587	3,301	3,289	3,378	3,933
Electrical equipment	36	9,037	9,271	9,767	10,449	9,975	9,575	9,267	8,865	9,516	11,682	13,537
Radio and TV receiving equipment	365	362	350	133	139	149	96	114	D	93	87	64
Communication equipment	366	5,147	5,174	5,117	5,455	4,798	4,159	3,584	S	3,381	3,954	4,939
Electronic components	367	2,354	2,826	3,357	3,630	3,684	3,655	3,496	3,177	3,320	5,105	5,870
Other electrical equipment	361-64,369	1,174	921	1,160	1,225	1,345	1,664	2,073	D	2,722	2,537	2,664
Transportation equipment	37	10,406	12,092	13,567	13,462	13,910	14,596	14,264	14,858	16,292	16,640	17,695
Motor vehicles and motor vehicles equipment	371	5,384	6,164	7,171	7,167	7,783	8,756	8,594	9,063	9,132	10,659	11,950
Other transportation equipment	373-75,379	258	279	330	356	361	337	283	262	289	297	279
Aircraft and missiles	372,376	4,764	5,649	6,066	5,939	5,766	5,503	5,387	5,533	6,871	5,684	5,466

See explanatory information and SOURCE at end of table.

Table C-30. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1984-94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Professional and scientific instruments	38	4,211	4,622	4,752	4,950	5,339	5,729	6,318	6,840	7,321	7,542	8,058
Scientific and mechanical measuring instruments	381-82	1,671	1,596	1,521	1,598	1,863	2,205	2,696	3,017	3,013	3,196	3,687
Optical, surgical, photographic, and other instruments	384-87	2,540	3,026	3,231	3,352	3,476	3,524	3,621	3,823	4,308	4,346	4,371
Other manufacturing industries	27,31,39	373	361	380	380	401	438	541	D	599	758	796
Nonmanufacturing industries 1/		3,252	4,401	4,740	5,144	7,257	10,302	16,351	22,941	23,363	24,690	23,756
Distribution by size of company (number of employees) total		51,404	57,043	59,932	61,403	66,672	73,501	81,602	90,580	94,388	94,591	97,131
Fewer than 500		3,781	5,127	6,203	6,200	S	S	S	11,285	11,532	13,006	12,802
500 to 999		1,341	1,531	1,765	1,610	1,748	1,934	2,144	7,819	7,807	3,048	3,426
1,000 to 4,999		4,618	5,249	6,243	6,281	6,820	7,546	8,363	9,403	10,865	12,219	13,533
5,000 to 9,999		2,764	3,350	3,455	3,753	4,075	4,509	4,997	7,233	7,495	8,371	8,087
10,000 to 24,999		8,546	8,366	8,489	9,681	10,512	11,631	12,890	12,397	12,328	12,606	13,625
25,000 or more		30,354	33,420	33,777	33,878	36,785	40,703	45,106	42,443	44,361	45,340	45,658

1/ Nonmanufacturing industries for 1991 and later years included SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.
Nonmanufacturing industries for 1990 and prior years included SICs: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY:
D = Data have been withheld to avoid disclosing operations of individual companies.
S = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
SIC = standard industrial classification

NOTES: Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded. As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-31. Federal funds for industrial R&D performance, by industry and size of company: 1984-94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Total		23,396	27,196	27,891	30,752	30,343	28,554	28,125	26,372	24,722	22,809	22,463
Textiles and apparel	22,23	D	D	D	D	D	D	D	S	D	D	D
Lumber, wood products, and furniture	24,25	0	0	0	0	D	0	0	D	D	D	D
Paper and allied products	26	D	D	D	D	D	0	0	D	D	D	D
Chemicals and allied products	28	191	230	179	190	238	126	123	209	S	D	D
Industrial chemicals	281-82,286	183	217	178	185	232	111	109	165	S	D	D
Drugs and medicines	283	D	D	1	D	6	D	D	D	S	15	8
Other chemicals	284-85,287-89	D	D	0	D	0	D	D	D	S	D	D
Petroleum refining and extraction	13,29	D	D	D	14	22	S	S	11	9	14	10
Rubber products	30	D	D	D	D	D	D	D	D	D	D	D
Stone, clay, and glass products	32	D	D	9	10	D	D	D	D	D	9	38
Primary metals	33	D	D	D	19	17	22	D	8	S	23	17
Ferrous metals and products	331-32,3398-99	D	D	D	D	1	D	D	1	D	17	D
Nonferrous metals and products	333-36	10	9	8	D	16	D	D	7	D	6	D
Fabricated metal products	34	69	49	95	150	163	178	203	226	294	222	243
Machinery	35	1,192	1,495	D	D	D	D	871	1,055	1,035	86	99
Office, computing, and accounting machines	357	D	D	D	D	D	D	D	D	D	33	28
Other machinery, except electrical	351-56,358-59	D	D	75	44	101	112	D	D	D	53	71
Electrical equipment	36	4,741	5,161	5,213	5,399	4,153	3,743	4,133	4,550	3,844	1,667	1,801
Radio and TV receiving equipment	365	D	D	0	0	0	0	0	0	D	D	D
Communication equipment	366	3,538	4,223	4,552	4,729	3,630	2,911	2,344	D	D	D	D
Electronic components	367	477	559	D	656	449	369	418	D	247	206	162
Other electrical equipment	361-64,369	D	D	D	14	74	463	1,371	D	D	D	D
Transportation equipment	37	D	D	17,708	20,784	20,865	19,262	17,097	12,570	11,202	10,617	10,392
Motor vehicles and motor vehicles equipment	371	673	820	D	D	D	D	D	D	D	D	D
Other transportation equipment	373-75,379	D	D	D	D	D	D	D	D	D	D	D
Aircraft and missiles	372,376	14,094	16,582	14,984	18,519	18,402	16,828	15,248	11,096	S	9,372	8,794

See explanatory information and SOURCE at end of table.

Table [illegible] Federal funds for industrial R&D performance, by industry and size of company: 1984-94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Professional and scientific instruments	38	391	391	351	272	191	263	737	1,865	2,221	2,577	3,384
Scientific and mechanical measuring instruments	381-82	D	D	D	D	S	S	S	D	2,143	2,484	3,266
Optical, surgical, photographic, and other instruments	384-87	D	D	D	D	95	101	87	D	78	92	118
Other manufacturing industries	27,31,39	D	D	2	D	D	D	D	D	61	D	D
Nonmanufacturing industries 1/		1,653	2,313	2,706	2,700	3,256	3,729	4,442	5,505	5,570	6,140	5,090
Distribution by size of company (number of employees) total		23,396	27,196	27,891	30,752	30,343	28,554	28,125	26,372	24,722	22,809	22,463
Fewer than 500		621	739	868	963	816	901	895	1,887	2,025	1,614	1,164
500 to 999		98	117	137	115	131	117	S	181	151	182	182
1,000 to 4,999		902	991	1,229	981	1,093	958	881	1,050	S	1,115	1,083
5,000 to 9,999		487	672	796	748	864	740	257	816	763	764	825
10,000 to 24,999		2,805	2,743	2,004	2,362	1,705	1,129	1,526	3,373	3,416	2,816	2,348
25,000 or more		18,483	21,934	23,213	25,583	25,734	24,709	24,436	19,065	17,346	16,319	16,862

1/ Nonmanufacturing industries for 1991 and later years included SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.
Nonmanufacturing industries for 1990 and prior years included SICs: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: D = Data have been withheld to avoid disclosing operations of individual companies.
S = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
SIC = standard industrial classification

NOTES: As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information. Industry R&D data are subject to future revisions. See Appendix A: Technical Notes.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-32. Total R&D funds as a percent of net sales in R&D-performing manufacturing companies: 1984-94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
						Percent						
Total		3.9%	4.4%	4.7%	4.6%	4.5%	4.3%	4.2%	4.2%	4.2%	3.8%	3.6%
Food, kindred, and tobacco products	20,21	D	D	D	0.6	D	D	D	0.5	0.5	0.5	0.5
Textiles and apparel	22,23	D	D	D	D	D	D	D	D	0.6	D	D
Lumber, wood products, and furniture	24,25	0.7	0.8	0.6	0.6	D	0.6	0.6	D	D	D	D
Paper and allied products	26	D	D	D	D	D	0.8	1.0	1.1	D	D	D
Chemicals and allied products	28	4.7	5.0	5.2	5.3	5.3	5.4	5.3	5.4	5.5	D	D
Industrial chemicals	281-82,286	4.0	4.4	4.6	4.7	4.4	4.2	4.5	4.6	4.6	D	D
Drugs and medicines	283	D	D	8.5	D	8.8	D	D	8.9	9.6	12.5	10.2
Other chemicals	284-85,287-89	D	D	3.3	D	3.4	D	D	3.1	2.7	D	D
Petroleum refining and extraction	13,29	D	D	D	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8
Rubber products	30	D	D	D	D	D	D	D	D	D	D	D
Stone, clay, and glass products	32	D	D	2.5	2.6	D	D	D	D	D	1.5	1.7
Primary metals	33	D	D	D	0.9	0.8	0.8	0.8	0.8	0.6	0.7	0.6
Ferrous metals and products	331-32,3398-99	D	D	D	D	0.5	D	D	D	D	0.5	D
Nonferrous metals and products	333-36	1.2	1.4	1.5	D	1.0	D	D	D	D	1.2	D
Fabricated metal products	34	1.5	1.5	1.5	1.5	1.3	1.5	1.4	1.5	1.5	1.4	1.2
Machinery	35	6.4	7.6	D	D	7.7	7.9	7.7	8.1	7.8	4.6	3.8
Office, computing, and accounting machines	357	D	D	D	D	D	D	D	D	D	9.9	7.9
Other machinery, except electrical	351-56,358-59	D	D	3.0	3.0	2.9	D	D	D	D	2.6	2.5
Electrical equipment	36	6.8	7.6	7.9	8.2	7.5	7.3	6.5	6.5	5.6	6.2	5.9
Radio and TV receiving equipment	365	D	D	3.6	3.2	2.4	1.8	1.6	D	D	D	D
Communication equipment	366	9.8	10.1	9.9	10.2	10.7	11.6	10.0	D	D	D	D
Electronic components	367	7.8	9.6	D	10.0	9.0	D	8.3	7.9	7.5	8.1	7.5
Other electrical equipment	361-64,369	D	D	D	2.7	2.5	D	3.7	D	D	D	D
Transportation equipment	37	D	D	8.3	8.7	8.9	8.1	7.5	7.3	7.1	6.4	5.9
Motor vehicles and motor vehicles equipment	371	3.4	3.8	D	D	D	D	D	D	D	D	D
Other transportation equipment	373-75,379	D	D	D	D	D	D	D	D	D	D	D
Aircraft and missiles	372,376	15.4	14.9	13.4	14.7	16.3	13.5	11.8	12.1	11.8	12.5	13.8
Professional and scientific instruments	38	8.3	8.9	8.8	7.9	7.4	7.2	8.0	9.1	9.4	9.7	9.2
Scientific and mechanical measuring instruments	381-82	D	D	D	D	7.9	7.4	8.6	10.0	10.6	11.5	11.0
Optical, surgical, photographic, and other instruments	384-87	D	D	D	D	7.3	7.3	7.7	8.1	8.3	8.1	7.3
Other manufacturing industries	27,31,39	D	D	1.2	D	D	D	D	D	D	D	D

See explanatory information and SOURCE at end of table.

Table C-32 Total R&D funds as a percent of net sales in R&D-performing manufacturing companies 1984-94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Percent										
Distribution by size of company (number of employees) total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fewer than 500		2.9	3.6	4.1	3.9	3.7	3.6	3.4	3.3	3.4	3.7	2.6
500 to 999		2.3	2.4	2.4	2.3	1.8	1.8	1.9	2.5	2.8	2.9	2.6
1,000 to 4,999		2.2	2.6	2.5	2.6	2.4	2.2	2.0	2.5	2.8	2.6	2.6
5,000 to 9,999		1.8	1.9	2.3	2.3	2.3	2.6	2.9	3.0	2.9	2.9	2.2
10,000 to 24,999		3.1	3.1	3.2	3.1	3.1	2.8	2.7	3.6	3.2	2.9	2.7
25,000 or more		5.3	6.2	6.5	6.6	6.3	5.8	5.6	5.6	5.6	5.2	5.2

KEY: D = Data have been withheld to avoid disclosing operations of individual companies.
SIC = standard industrial classification

NOTE: As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-33. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies: 1984-94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
						percent						
Total		2.6%	3.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.2%	3.3%	3.1%	2.9%
Food, kindred, and tobacco products	20,21	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Textiles and apparel	22,23	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6
Lumber, wood products, and furniture	24,25	0.7	0.8	0.6	0.6	0.6	0.6	0.6	0.9	0.9	0.7	0.6
Paper and allied products	26	0.8	0.8	0.7	0.6	0.8	0.8	1.0	1.1	1.0	1.1	1.0
Chemicals and allied products	28	4.6	4.9	5.1	5.2	5.2	5.4	5.3	5.3	5.4	6.0	5.1
Industrial chemicals	281-82,286	3.8	4.2	4.4	4.4	4.2	4.1	4.4	4.4	4.4	4.4	3.3
Drugs and medicines	283	8.2	8.0	8.4	8.7	8.8	8.9	8.8	8.9	9.6	12.5	10.2
Other chemicals	284-85,287-89	2.9	3.1	3.3	3.3	3.4	3.9	3.4	3.0	2.7	2.7	2.5
Petroleum refining and extraction	13,29	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8
Rubber products	30	1.9	1.8	1.7	1.6	1.7	1.9	2.1	2.3	2.3	2.1	2.3
Stone, clay, and glass products	32	1.9	2.3	2.4	2.5	2.0	1.8	1.7	1.6	1.6	1.5	1.5
Primary metals	33	0.9	0.9	1.0	0.9	0.7	0.7	0.8	0.8	0.6	0.7	0.6
Ferrous metals and products	331-32,3398-99	0.6	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.3
Nonferrous metals and products	333-36	1.2	1.4	1.5	1.3	1.0	1.0	1.2	1.2	0.7	1.2	0.9
Fabricated metal products	34	1.4	1.4	1.4	1.2	1.1	1.2	1.1	1.2	1.1	1.1	1.0
Machinery	35	5.8	6.7	7.3	7.1	6.8	7.3	7.2	7.5	7.3	4.5	3.8
Office, computing, and accounting machines	357	10.5	12.4	12.4	12.3	11.2	13.1	14.4	14.9	13.7	9.8	7.9
Other machinery, except electrical	351-56,358-59	2.5	2.6	2.9	3.0	2.8	2.6	2.3	2.9	2.9	2.5	2.5
Electrical equipment	36	4.5	4.8	5.1	5.4	5.3	5.2	4.5	4.3	4.0	5.4	5.2
Radio and TV receiving equipment	365	3.7	4.3	3.6	3.2	2.4	1.8	1.6	1.0	0.6	4.0	1.0
Communication equipment	366	5.1	5.4	5.2	5.5	6.1	6.8	6.1	S	7.0	10.1	10.3
Electronic components	367	6.6	8.2	9.2	8.5	8.0	7.7	7.4	7.2	7.0	7.8	7.3
Other electrical equipment	361-64,369	2.2	2.0	2.2	2.6	2.3	2.3	2.2	2.2	2.1	2.3	2.1
Transportation equipment	37	3.3	3.4	3.6	3.4	3.5	3.5	3.4	4.0	4.2	3.9	3.7
Motor vehicles and motor vehicles equipment	371	3.0	3.1	3.3	3.4	3.4	3.7	3.7	4.1	4.0	3.7	3.4
Other transportation equipment	373-75,379	2.0	2.3	2.7	2.5	2.6	2.5	2.1	2.1	2.1	1.9	1.2
Aircraft and missiles	372,376	4.0	3.9	4.0	3.6	3.9	3.3	3.1	4.0	4.7	4.7	5.3
Professional and scientific instruments	38	7.6	8.3	8.2	7.5	7.1	6.8	7.1	7.1	7.2	7.2	6.5
Scientific and mechanical measuring instruments	381-82	8.3	8.4	8.4	8.1	7.6	6.9	6.9	6.3	6.2	6.4	5.8
Optical, surgical, photographic, and other instruments	384-87	7.3	8.1	8.0	7.2	7.1	7.1	7.5	8.0	8.2	7.9	7.2
Other manufacturing industries	27,31,39	1.1	1.0	1.2	1.1	1.0	0.9	0.9	0.8	1.3	1.3	1.1

See explanatory information and SOURCE at end of table.

Table C-33. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, 1984-94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
						percent						
Distribution by size of company (number of employees) total		2.6%	3.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.2%	3.3%	3.1%	2.9%
Fewer than 500		2.8	3.4	4.0	3.8	3.7	3.5	3.3	3.2	3.2	3.6	2.5
500 to 999		2.2	2.2	2.2	2.2	1.7	1.7	1.7	2.4	2.7	2.7	2.5
1,000 to 4,999		2.0	2.4	2.4	2.4	2.3	2.1	1.9	2.4	2.7	2.5	2.5
5,000 to 9,999		1.6	1.8	2.0	2.0	2.0	2.1	2.8	2.9	2.8	2.8	2.2
10,000 to 24,999		2.5	2.5	2.6	2.5	2.6	2.5	2.5	3.0	2.6	2.5	2.5
25,000 or more		3.2	3.5	3.7	3.8	3.7	3.7	3.6	3.8	4.0	3.7	3.6

KEY: S = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
SIC = standard industrial classification

NOTES: Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

[illegible]

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Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		Millions of current dollars											
Total		119,595	22,463	97,131	7,017	939	6,078	23,490	4,119	19,372	89,088	17,405	71,683
Food, kindred, and tobacco products	20,21	1,476	0	1,476	114	0	114	473	0	473	889	0	889
Textiles and apparel	22,23	D	D	316	D	D	42	D	D	47	D	D	228
Lumber, wood products, and furniture	24,25	D	D	201	D	D	27	D	D	43	D	D	131
Paper and allied products	26	D	D	1,263	D	D	211	D	D	619	433	0	433
Chemicals and allied products	28	D	D	16,559	2,608	9	2,599	D	D	5,386	9,186	610	8,575
Industrial chemicals	281-82,286	D	D	4,780	D	D	1,066	D	D	D	D	D	D
Drugs and medicines	283	9,633	8	9,625	D	1	D	3,333	5	3,328	D	2	D
Other chemicals	284-85,287-89	D	D	2,154	D	D	D	D	D	D	D	D	D
Petroleum refining and extraction	13,29	1,950	10	1,939	D	0	D	694	5	688	D	5	D
Rubber products	30	D	D	1,432	33	0	33	D	D	215	1,184	0	1,184
Stone, clay, and glass products	32	591	38	553	50	0	50	212	37	175	329	1	328
Primary metals	33	690	17	672	D	D	102	D	D	206	D	D	364
Ferrous metals and products	331-32,3398-99	D	D	241	D	D	19	D	D	84	D	D	138
Nonferrous metals and products	333-36	D	D	431	83	0	83	D	D	122	D	D	226
Fabricated metal products	34	1,111	243	868	D	D	78	D	D	184	833	226	606
Machinery	35	8,110	99	8,011	261	7	254	1,464	35	1,429	6,385	56	6,328
Office, computing, and accounting machines	357	4,106	28	4,078	D	D	62	D	D	713	3,316	13	3,303
Other machinery, except electrical	351-56,358-59	4,004	71	3,933	D	D	192	D	D	716	3,068	43	3,025
Electrical equipment	36	15,338	1,801	13,537	D	D	388	D	D	2,597	12,203	1,653	10,550
Radio and TV receiving equipment	365	D	D	64	D	D	D	D	0	D	36	1	35
Communication equipment	366	D	D	4,939	D	D	D	D	D	D	D	D	4,111
Electronic components	367	6,032	162	5,870	D	D	121	D	D	1,370	4,529	150	4,379
Other electrical equipment	361-64,369	D	D	2,664	D	D	118	D	D	521	D	D	2,025
Transportation equipment	37	28,087	10,392	17,695	244	109	136	2,044	784	1,259	25,799	9,499	16,300
Motor vehicles and motor vehicles equipment	371	D	D	11,950	D	D	D	D	D	D	D	D	D
Other transportation equipment	373-75,379	D	D	279	31	0	31	D	D	D	D	D	D
Aircraft and missiles	372,376	14,260	8,794	5,466	D	D	D	D	D	D	12,787	7,978	4,809

See explanatory information and SOURCE at end of table.

Table [illegible] Funds for performance of basic research, applied research, and development, by industry, and source of funds: 1994

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Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		Millions of current dollars											
Professional and scientific instruments	38	11,441	3,384	8,058	D	D	467	2,086	299	1,787	D	D	5,803
Scientific and mechanical measuring instruments	381-82	6,952	3,266	3,687	D	D	197	1,409	271	1,138	D	D	2,351
Optical, surgical, photographic, and other instruments	384-87	4,489	118	4,371	D	D	270	677	28	649	D	D	3,452
Other manufacturing industries	27,31,39	D	D	796	D	D	93	129	0	129	D	D	574
Nonmanufacturing industries 1/		28,846	5,090	23,756	2,036	689	1,346	6,169	2,035	4,134	20,641	2,366	18,275

1/ Nonmanufacturing industries include SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.

KEY: D = Data have been withheld to avoid disclosing operations of individual companies.
SIC = standard industrial classification

NOTE: Industry R&D data are subject to future revisions See Appendix A: Technical Notes.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

[illegible] FTE R&D scientists and engineers in R&D-performing companies [illegible]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
		Thousands											
Total (January)		584.1	622.5	671	695.8	708.6	722.5	743.6	773.4	779.3	764.7	768.5	749.2
Total (Annual average)		603.3	646.8	683.4	702.2	715.6	733	758.5	776.4	783.8	764.5	758.8	NA
Food, kindred, and tobacco products	20,21	7.4	S	S	S	S	S	S	9.4	9.8	9.6	10.3	9
Textiles and apparel	22,23	2.3	2.8	2.6	2.4	2.4	2.5	2.8	S	2.8	3.1	3.3	3.1
Lumber, wood products, and furniture	24,25	T	S	S	1.3	1.3	1.4	S	S	1.5	1.6	3.3	2.3
Paper and allied products	26	6.6	6.6	6.4	6	6.1	6.4	8.5	S	10.7	10.6	10.6	10.6
Chemicals and allied products	28	69.8	71.1	75.8	75.2	75.8	78.3	80.4	81.6	85.6	86.5	93.1	91.5
Industrial chemicals	281-82,286	25.6	23.5	24.9	S	S	S	S	S	29.9	26.4	28.8	27
Drugs and medicines	283	T	30.8	31.8	32.6	33	34.4	34.3	35.4	38.7	42.3	48.5	50.3
Other chemicals	284-85,287-89	13.4	16.7	19.1	20.2	20.3	18.8	18.9	17	17	17.8	15.8	14.2
Petroleum refining and extraction	13,29	13.3	13.5	10.4	9.9	9.5	10.7	11.1	11.4	11.5	11	9.7	9
Rubber products	30	T	S	S	S	S	S	S	S	14.8	13	9	8.8
Stone, clay, and glass products	32	5.6	6.6	7.5	8.6	8.6	7.6	7	6	5.3	5.1	4	4.3
Primary metals	33	8.4	7.1	5.7	5.5	5.6	5.5	5.2	4.6	5.1	4.6	5.1	6.7
Ferrous metals and products	331-32,3398-99	5.3	4.2	2.5	S	2.3	2.3	S	S	1.7	1.6	2.6	1.9
Nonferrous metals and products	333-36	3.1	2.9	3.2	3.4	3.3	3.3	3.3	3	S	S	2.5	4.8
Fabricated metal products	34	16.6	S	S	9.9	10.5	9.9	10.1	S	8.7	7.9	10.2	9.5
Machinery	35	87	81.7	89.7	95.8	98.4	100.4	113.3	109.7	99.3	97.4	70.4	66.3
Office, computing, and accounting machines	357	56.5	61.8	71.9	73.4	74.4	75	84.7	77.6	67.1	65.8	34.6	30.3
Other machinery, except electrical	351-56,358-59	30.5	19.9	17.8	22.4	24	25.4	28.6	32.1	32.2	31.6	35.8	35.9
Electrical equipment	36	113.2	113.2	117.9	130.4	132.5	122.5	105.2	95.9	91.9	89.2	96.5	105.5
Radio and TV receiving equipment	365	T	S	1.8	1.2	1.3	1.5	0.8	1	1	1	0.8	0.9
Communication equipment	366	59.3	62.2	65	71.9	73.1	58	47.1	35.8	31.2	S	36	43.3
Electronic components	367	T	29.2	S	43.7	44.3	42.8	S	32.6	28.4	28.9	40.1	41
Other electrical equipment	361-64,369	18.4	17.9	16.5	13.6	S	S	21.3	S	31.2	28.8	19.6	20.3
Transportation equipment	37	T	160.3	179.2	187.3	188.2	185.4	170.2	149.7	141.1	147.5	129.6	115.8
Motor vehicles and motor vehicles equipment	371	28.6	28.7	33.9	46.5	47.3	45.8	49.4	45.3	44.5	45.1	51	51.3
Other transportation equipment	373-75,379	T	S	S	S	S	S	S	S	S	S	5.8	6
Aircraft and missiles	372,376	111.5	130.2	144.8	136.3	136.4	134.8	115.3	100.2	92.9	97.9	72.8	58.5

See explanatory information and SOURCE at end of table.

Table C-33. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies: 1984-95

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
		Thousands											
Professional and scientific instruments	38	T	S	S	S	S	S	S	S	S	S	100.6	90.6
Scientific and mechanical measuring instruments	381-82	T	S	S	S	S	S	S	S	S	S	66.4	69.2
Optical, surgical, photographic, and other instruments	384-87	T	19.8	24	24.6	24.9	14.5	8.1	S	S	20.8	34.2	21.4
Other manufacturing industries	27,31,39	T	S	S	6.3	6.4	5.4	5.6	S	6	5.8	15.5	7.7
Nonmanufacturing industries 1/		49.8	66.8	75.1	96.4	101.9	125.2	S	S	202.6	196.5	197.4	208.5
Distribution by size of company (number of employees) total		584.1	622.5	671	695.8	708.6	722.5	743.6	773.4	779.3	764.7	768.5	749.2
Fewer than 500		81.9	78.3	S	105.2	109	105.4	S	S	142.1	125.1	148.6	137.5
500 to 999		NA	16.5	S	18.4	19.3	18	18.6	18.6	46.2	46.1	27.9	30.1
1,000 to 4,999		52.6	61.6	66.7	76.4	81.9	76.1	75.4	79.3	94.2	99.3	108.9	110.9
5,000 to 9,999		30.1	28.5	38.9	40.5	40.2	47.3	57.2	55.1	57.6	56.4	60.3	62.2
10,000 to 24,999		84	89.9	88.4	92	94.5	87	73.9	90.3	99.9	102.6	90.6	91.7
25,000 or more		335.5	347.6	365.3	363.3	363.7	388.7	404.2	408.4	339.2	335.2	332.1	316.8

1/ Nonmanufacturing industries for 1991 and later years included SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.
Nonmanufacturing industries for 1990 and prior years included SICs: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY:

S = Data have been withheld because of imputation of more than 50 percent.
T = Data not separately available, but are included in total.
NA = Not available
SIC = standard industrial classification

NOTE: As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-3[illegible]: Cost per R&D scientist or engineer in R&D performing companies, by industry and size of company: 1984-94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Total		124,000	130,200	128,500	128,800	132,300	134,500	141,300	148,600	157,912	153,336	157,601
Food, kindred, and tobacco products	20,21	D	D	D	S	D	D	D	130,000	144,215	135,261	153,609
Textiles and apparel	22,23	D	D	D	D	D	D	D	D	D	D	D
Lumber, wood products, and furniture	24,25	115,400	116,300	S	S	D	S	S	D	D	D	D
Paper and allied products	26	D	D	D	D	D	S	S	D	D	D	D
Chemicals and allied products	28	112,500	116,300	117,100	125,000	139,400	149,000	159,000	167,600	183,508	D	D
Industrial chemicals	281-82,286	132,000	144,600	150,200	S	S	S	S	181,000	193,871	D	D
Drugs and medicines	283	D	D	113,600	D	142,800	D	D	D	196,631	202,607	195,145
Other chemicals	284-85,287-89	D	D	83,100	D	105,600	D	D	D	135,423	D	D
Petroleum refining and extraction	13,29	D	D	D	187,400	182,700	194,000	201,800	217,000	205,318	208,360	209,439
Rubber products	30	D	D	D	D	D	D	D	D	D	D	D
Stone, clay, and glass products	32	D	D	118,000	122,500	D	D	D	D	D	137,990	141,842
Primary metals	33	D	D	D	131,500	118,600	S	D	142,200	114,057	138,552	116,556
Ferrous metals and products	331-32,3398-99	D	D	D	D	S	D	D	D	D	138,851	D
Nonferrous metals and products	333-36	112,000	136,400	138,800	D	S	D	D	D	D	138,326	D
Fabricated metal products	34	111,600	112,900	S	76,600	88,100	S	S	115,500	123,828	129,131	113,168
Machinery	35	124,500	142,500	D	D	D	130,000	138,500	147,800	152,797	100,631	118,717
Office, computing, and accounting machines	357	D	D	D	D	D	D	D	D	D	99,564	126,476
Other machinery, except electrical	351-56,358-59	D	D	119,200	98,300	99,400	D	D	D	D	102,213	111,691
Electrical equipment	36	121,700	124,900	120,700	124,300	124,100	132,400	142,800	147,100	150,118	144,725	151,872
Radio and TV receiving equipment	365	D	D	88,700	97,900	124,200	103,400	113,200	D	D	D	D
Communication equipment	366	143,000	147,800	141,300	155,300	160,300	170,600	177,100	S	D	D	D
Electronic components	367	100,500	114,100	D	98,400	S	S	128,400	D	127,801	154,366	148,761
Other electrical equipment	361-64,369	D	D	D	S	68,500	S	S	D	D	D	D
Transportation equipment	37	D	D	170,700	183,400	195,600	211,700	215,700	189,400	191,274	196,777	228,881
Motor vehicles and motor vehicles equipment	371	211,400	223,100	D	D	D	D	D	D	D	D	D
Other transportation equipment	373-75,379	D	D	S	S	D	D	D	D	D	D	D
Aircraft and missiles	372,376	156,000	161,700	149,800	180,400	193,300	207,300	213,700	177,000	180,552	176,450	217,219

See explanatory information and SOURCE at end of table.

Table C-3[illegible]. Cost per R&D scientist or engineer in R&D performing companies, by industry and size of company: 1984-94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		Millions of current dollars										
Professional and scientific instruments	38	116,900	122,000	S	S	S	S	S	S	S	115,180	119,693
Scientific and mechanical measuring instruments	381-82	D	D	D	D	S	S	S	S	S	94,036	102,570
Optical, surgical, photographic, and other instruments	384-87	D	D	D	D	316,700	S	S	S	S	161,721	161,435
Other manufacturing industries	27,31,39	D	D	S	D	D	D	D	D	D	D	D
Nonmanufacturing industries 1/		84,100	94,600	86,800	69,100	74,900	S	S	137,400	152,411	159,188	142,125
Distribution by size of company (number of employees) total		124,000	130,200	128,500	128,800	132,300	134,500	141,300	148,600	157,912	153,336	157,601
Fewer than 500		55,000	S	70,600	66,800	67,100	66,200	S	103,400	111,358	106,888	85,793
500 to 999		87,200	S	103,400	92,600	S	98,200	S	178,700	176,585	87,233	138,366
1,000 to 4,999		96,700	97,300	106,400	91,900	100,600	101,900	91,400	119,400	127,135	128,565	139,693
5,000 to 9,999		111,000	119,[illegible]00	108,400	102,900	100,400	102,500	110,800	150,800	148,285	156,899	152,227
10,000 to 24,999		130,500	124,600	122,300	132,700	143,000	127,300	135,300	167,300	156,190	160,229	182,243
25,000 or more		143,000	155,300	154,300	157,700	160,700	168,200	193,700	180,100	182,839	184,804	195,890

1/ Nonmanufacturing industries for 1991 and later years included SICs: 07-10, 12-17, 40-42, 44-65, 67, 701, 73, 75-76, 78-81, 83-84, 87 and 89.
Nonmanufacturing industries for 1990 and prior years included SICs: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY:
D = Data have been withheld to avoid disclosing operations of individual companies.
S = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
SIC = standard industrial classification

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table C-37. R&D expenditures at universities and colleges, by source of funds and science and engineering field: fiscal years 1987-94

Page 1 of 2

Source and field	1987	1988	1989	1990	1991	1992	1993	1994
	Millions of current dollars							
Total	12,153	13,463	14,976	16,285	17,579	18,807	19,940	21,081
Source of Funds:								
Federal Government	7,343	8,193	8,990	9,636	10,232	11,090	11,956	12,661
State and local governments	1,023	1,106	1,223	1,324	1,473	1,491	1,559	1,562
Industry	790	872	995	1,128	1,205	1,280	1,361	1,430
Institutional funds	2,168	2,356	2,697	3,006	3,362	3,538	3,578	3,838
All other sources	828	935	1,071	1,191	1,307	1,409	1,486	1,590
Field:								
Engineering,total	1,892	2,096	2,392	2,656	2,903	3,060	3,152	3,324
Aeronautical and astronautical	108	123	148	163	180	196	207	218
Chemical	148	163	194	218	244	261	268	276
Civil	191	224	245	284	315	339	367	392
Electrical	451	509	595	663	679	703	697	725
Mechanical	275	304	343	391	421	451	479	494
Metallurgical and materials 1/	NA	NA	NA	274	304	294	304	318
Other, n.e.c.	719	774	867	663	760	816	830	901
All sciences, total	10,261	11,367	12,584	13,629	14,676	15,746	16,788	17,757
Physical sciences	1,398	1,554	1,647	1,807	1,940	2,053	2,127	2,171
Astronomy	108	127	137	170	210	233	252	274
Chemistry	514	565	606	648	667	698	737	759
Physics	673	740	786	842	870	913	929	942
Other, n.e.c.	103	122	117	147	193	209	209	196
Environmental sciences	839	894	1,003	1,068	1,116	1,239	1,320	1,426
Atmospheric	132	138	165	173	175	194	212	220
Earth sciences	284	294	324	354	383	412	416	458
Oceanography	299	333	359	377	390	428	461	459
Other, n.e.c.	123	128	156	163	169	205	232	289
Mathematical sciences	177	199	215	222	230	248	272	279
Computer sciences	372	408	473	515	554	556	606	660
Life sciences	6,529	7,257	8,061	8,726	9,472	10,196	10,850	11,521
Agricultural sciences	1,121	1,176	1,282	1,349	1,458	1,512	1,558	1,663
Biological sciences	2,144	2,408	2,640	2,859	3,064	3,303	3,535	3,759
Medical sciences	3,000	3,377	3,819	4,154	4,546	4,964	5,324	5,634
Other, n.e.c.	264	296	321	363	404	417	433	465

See expanatory information and SOURCE at end of table.

[illegible]

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Source and field	1987	1988	1989	1990	1991	1992	1993	1994
	Millions of current dollars							
Psychology	187	213	234	253	283	328	350	359
Social sciences	502	552	633	703	750	815	896	951
Economics	149	163	187	201	209	222	231	241
Political science	81	87	103	115	125	142	151	165
Sociology	95	108	119	132	156	163	183	196
Other, n.e.c.	177	194	224	255	260	288	331	348
Other sciences, n.e.c.	256	290	318	336	331	311	366	392

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = not elsewhere classified
NA = not available

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1994

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	1987	1988	1989	1990	1991	1992	1993	1994
	Millions of current dollars							
Total	7,343	8,193	8,990	9,636	10,232	11,090	11,956	12,661
Field:								
Engineering, total	1,113	1,230	1,384	1,526	1,638	1,752	1,859	1,973
Aeronautical and astronautical	80	94	115	127	137	150	159	165
Chemical	77	86	101	110	118	126	140	151
Civil	90	102	102	117	124	144	152	158
Electrical	292	330	387	432	436	449	459	480
Mechanical	178	193	214	238	251	269	308	322
Metallurgical and materials 1/	NA	NA	NA	139	153	143	154	156
Other, n.e.c.	395	425	465	362	419	470	486	539
All sciences, total	6,230	6,963	7,606	8,111	8,595	9,338	10,097	10,688
Physical sciences	1,051	1,158	1,198	1,315	1,384	1,476	1,514	1,565
Astronomy	71	84	88	113	135	153	159	183
Chemistry	368	403	422	445	448	476	502	520
Physics	535	580	606	652	669	700	702	724
Other, n.e.c.	77	91	82	105	133	146	152	138
Environmental sciences	546	589	650	681	699	790	871	949
Atmospheric	109	112	129	131	129	140	160	164
Earth sciences	159	174	187	204	217	238	243	267
Oceanography	217	238	260	262	264	306	332	325
Other, n.e.c.	60	64	75	83	89	106	136	192
Mathematical sciences	132	150	157	161	170	183	203	206
Computer sciences	257	289	324	342	372	380	422	463
Life sciences	3,837	4,326	4,784	5,083	5,418	5,911	6,385	6,758
Agricultural sciences	298	322	349	353	377	418	450	495
Biological sciences	1,420	1,608	1,736	1,844	1,950	2,137	2,309	2,459
Medical sciences	1,962	2,213	2,503	2,671	2,849	3,113	3,370	3,531
Other, n.e.c.	158	183	196	215	242	243	257	273
Psychology	124	140	153	164	186	215	234	243
Social sciences	169	189	212	226	253	281	338	359
Economics	43	49	54	54	60	66	77	76
Political science	24	25	26	25	29	35	43	52
Sociology	44	48	54	60	72	82	91	97
Other, n.e.c.	57	67	78	87	92	99	127	135
Other sciences, n.e.c.	115	121	128	138	112	102	129	145

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = not elsewhere classified
NA = not available

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1994

[illegible]

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	1987	1988	1989	1990	1991	1992	1993	1994
	Millions of current dollars							
Total	4,206	4,531	4,730	4,832	5,078	5,247	5,295	5,271
Field:								
Engineering, total	1,547	1,614	1,643	1,708	1,789	1,804	1,713	1,691
Aeronautical and astronautical	132	147	145	144	156	163	159	128
Chemical	42	44	40	41	70	78	76	79
Civil	18	18	16	15	16	34	33	31
Electrical	550	556	569	605	639	598	534	508
Mechanical	571	603	628	545	488	469	417	502
Metallurgical and materials 1/	NA	NA	NA	86	138	147	132	64
Other, n.e.c.	234	247	244	273	282	316	362	379
All sciences, total	2,659	2,916	3,087	3,124	3,290	3,443	3,582	3,580
Physical sciences	1,660	1,717	1,828	1,825	1,917	2,010	2,209	2,189
Astronomy	82	118	112	112	121	138	145	173
Chemistry	261	275	274	261	252	268	281	273
Physics	1,258	1,264	1,378	1,383	1,461	1,498	1,675	1,630
Other, n.e.c.	59	61	63	69	83	106	108	112
Environmental sciences	258	289	299	292	319	353	345	397
Atmospheric	104	91	99	103	126	149	156	184
Earth sciences	76	80	65	65	72	77	63	59
Oceanography	2	2	2	2	15	16	17	13
Other, n.e.c.	76	116	133	122	106	111	108	140
Mathematical sciences	122	126	129	135	132	124	120	114
Computer sciences	473	622	668	686	716	700	649	619
Life sciences	115	124	131	142	146	191	191	190
Agricultural sciences	1	1	1	1	1	1	1	1
Biological sciences	87	92	101	113	115	139	137	114
Medical sciences	11	13	10	10	11	16	15	15
Other, n.e.c.	17	17	18	18	18	35	38	59
Psychology	1	1	1	1	1	1	1	1
Social sciences	21	28	23	30	34	21	22	23
Economics	3	1	0	1	1	1	1	1
Political science	5	6	4	6	8	5	5	6
Sociology	0	0	0	0	0	0	0	0
Other, n.e.c.	14	21	19	23	26	16	16	16
Other sciences, n.e.c.	9	10	8	13	25	42	45	48

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = not elsewhere classified
NA = not available

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1994

[illegible]

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Year	GDP		GDP price deflator		Rates of inflation	
	Calendar year	Fiscal year	Calendar year	Fiscal year	Calendar year	Fiscal year
	Billions of current dollars		1992 = 1.000		Percent	
1960	526.6	518.3	0.233	0.233	--	--
1961	544.8	530.4	0.236	0.237	1.2	1.6
1962	585.2	567.3	0.239	0.239	1.3	1.0
1963	617.4	599.0	0.242	0.242	1.2	1.3
1964	663.0	639.8	0.246	0.245	1.5	1.2
1965	719.1	686.8	0.250	0.249	1.9	1.7
1966	787.8	752.7	0.257	0.255	2.8	2.2
1967	833.6	811.9	0.266	0.263	3.2	3.3
1968	910.6	868.0	0.277	0.273	4.4	3.6
1969	982.2	948.1	0.290	0.285	4.7	4.5
1970	1,035.6	1,009.4	0.306	0.300	5.3	5.3
1971	1,125.4	1,077.4	0.321	0.316	5.2	5.1
1972	1,237.3	1,177.0	0.335	0.331	4.2	4.8
1973	1,382.6	1,306.8	0.354	0.345	5.6	4.3
1974	1,496.9	1,438.1	0.385	0.370	8.9	7.1
1975	1,630.6	1,554.5	0.422	0.408	9.4	10.3
1976	1,819.0	1,730.4	0.446	0.437	5.8	7.2
1977	2,026.9	1,971.4	0.475	0.470	6.4	7.5
1978	2,291.4	2,212.6	0.509	0.503	7.3	6.9
1979	2,557.5	2,495.9	0.553	0.545	8.5	8.3
1980	2,784.2	2,718.9	0.604	0.593	9.3	8.9
1981	3,115.9	3,049.1	0.661	0.652	9.4	9.8
1982	3,242.1	3,211.3	0.702	0.698	6.3	7.1
1983	3,514.5	3,421.9	0.732	0.730	4.2	4.6
1984	3,902.4	3,812.0	0.759	0.758	3.8	3.8
1985	4,180.7	4,102.1	0.786	0.784	3.4	3.5
1986	4,422.2	4,374.3	0.806	0.806	2.6	2.8
1987	4,692.3	4,605.1	0.831	0.829	3.1	2.9
1988	5,049.6	4,953.5	0.861	0.858	3.7	3.5
1989	5,438.7	5,351.8	0.897	0.894	4.2	4.2
1990	5,743.8	5,684.5	0.936	0.932	4.4	4.2
1991	5,916.7	5,858.8	0.973	0.972	3.9	4.3
1992	6,244.4	6,143.2	1.000	1.000	2.8	2.9
1993	6,553.0	6,470.8	1.026	1.026	2.6	2.6
1994	6,935.7	6,830.4	1.050	1.050	2.3	2.3
1995	7,253.8	7,186.9	1.076	1.076	2.5	2.4
1996 (projected)	7,574.4	7,484.6	1.100	1.101	2.3	2.3
1997 (projected)	7,957.7	7,859.8	1.129	1.129	2.6	2.6
1998 (projected)	8,366.5	8,263.5	1.160	1.160	2.8	2.7
1999 (projected)	8,790.2	8,681.4	1.191	1.191	2.7	2.7

NOTES: Data are projected for 1996-99. Data for this table are on a postbenchmark basis, which, at this writing, are unavailable for years earlier than those shown. Comparable data in Table C-1, used in calculations for this report, are on a prebenchmark basis, beginning in 1953. (See Notes in table C-1.) Projections are from the Mid-Session Review of the 1997 Budget, July 1996, updated for recent GDP revisions.

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis and Office of Management and Budget